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PROCEEDINGS
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1946

ON SIAMESE BIRDS

BY RODOLPHE MEYER DE SCHAUENSEE

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INTRODUCTION

Between the years 1933 and 1938 the Academy received large collections of birds from various regions in Siam. In 1939 plans were completed for my collectors to go to Mt. Muleyit, a classic collecting locality in Tenasserim, lying on the Siamese border. Years ago many birds were described from there and it was hoped to secure comparative material which would facilitate the study of our Siamese collections. Birds from the Muleyit region are largely lacking in this country, and the results of such an expedition were felt to be very worth while.

Unfortunately the war upset these plans and the project had to be abandoned. As parts of Siam were visited during these years mentioned in which no collections had been made before, it seems advisable now to record the results of the various field trips, particularly as it now appears that for some time to come collecting in south-eastern Asia will be difficult, if not impossible.

The regions dealt with in this paper exclude the northern part of Siam, as this has already most ably been dealt with by Mr. H. G. Deignan in his *Birds of Northern Thailand* (Bull. U. S. Nat. Mus., no. 186, pp. 1-616, 1945). Birds from northern Siam secured by my collectors in 1935 and 1938 have been turned over for study to Mr. Deignan and he will shortly publish a summary of his findings. These collections are from the Ban Cheong Mts., near Chiang Rai, Me Phun and Me Lam Phan in north-central Siam, and Doi Pha Hom Pok (7532 ft.), a magnificent collecting locality, on the Shan-Siam frontier. The last is the only known Siamese

habitat of many species, which here apparently find the southernmost limit of their distribution. Many others which are exceedingly rare elsewhere in Siam are found commonly in its forests.

Below will be found a list, with dates, of localities at which my collectors secured specimens between 1933 and 1938.

1933. November-December, Kratt.

1934. January, Ban Thung Luang; March, Keng Sok and Pran; June-July, Srisawat.

1934-35. December-January, Kapang and Nong Tao.

1935. March-April, Ban Cheong Mts.; Keng Tung, Southern Shan States (extra limital); August-September, Me Phun and Me Lam Phan.

1935-36. December-February, Chanuman, Kemraj and Khulu.

1936. August-September, Khao Bhanam Bencha; September-October, Tachin; October, Waterfall, Trang; October-November, Rayong.

1937. August-October, Khao Nok Wua and Khao Luang.

1938. January-February, Doi Pha Hom Pok; May-June, Khao Soi Dao and Khao Sabab.

Other localities visited during these years, all for comparatively short periods, but some of them more than once, were, Ban Pong, Petriu, Hua Mak, Paknam and Sriracha, all in the vicinity of Bangkok.

These many field trips were accomplished under the able supervision of Y. Siah, of Bangkok, who accompanied me on three collecting expeditions in Siam (1928, 1928-29, 1932-33). Assisting him were Layang Gaddi, Lucas Bah and Peter Cheron, all of whom also worked with me in Siam. They are all able and thoroughly reliable collectors, willing to work in any kind of country, and whose greatest reward is the securing of birds which they "have never seen before." Because of this keenness their collections always contain many birds of exceptional interest.

During the preparation of this paper I have been in frequent correspondence with Mr. H. G. Deignan, of the United States National Museum, Washington, and I must acknowledge a great debt of gratitude to him for his many suggestions, and for the advice which he so freely gave. He was also kind enough to compare specimens, which I sent him, with his material and I am glad to say that in almost every instance we agree on the identification of specimens and on the various problems connected with the ornithology of Siam. He also has been kind enough to look up on his maps, or those of the Library of Congress, certain localities the exact position of which I was uncertain.

I also wish to express my thanks to Dr. Ernst Mayr, of the American Museum of Natural History, New York, for being so kind as to lend me

specimens from the collections in his charge, when I required comparative material not contained in our museum.

The names of localities are spelled as given by my collectors on the labels of the birds, for this will avoid confusion if later on specimens from given localities are required for comparative purposes. In the list of localities the more correct spelling, when there is one, is given.

The colors of the soft parts are recorded as they appear on the back of the labels. All measurements are given in millimeters. Wings are measured flat against the ruler to get the maximum length. The exposed culmen is measured unless otherwise stated.

In the following paper 443 forms are listed. Described as new subspecies are the following:

Lacedo pulchella deignani
Pitta cyanea peninsularis
Tephrodornis gularis mekongensis

Garrulax leucolophus peninsulae
Mixornis gularis deignani
Aethopyga siparaja trangensis

In a preliminary paper *Parus major templorum* from Wat Pa, and *Parus major nubicolus* from Pha Hom Pok were described as new forms (Notulae Naturae, no. 169, 1946).

List of Localities

The places listed below are the localities at which the specimens recorded in this paper were secured. The spelling is that given on the labels attached to the birds.

Localities not listed will be found on the map published in these Proceedings (86, 1934, p. 166). Riley (Bull. 172, U. S. Nat. Mus., 1938, pp. 5-12) has published a valuable list of Siamese localities at which W. L. Abbott and H. M. Smith secured their specimens.

BAN PONG.—On the east bank of the Me Kong River, where the Bangkok-Singapore Railway turns sharply eastward, away from the river, toward the capital.

BAN THUNG LUANG.—A village, on the coastal plain in southwestern Siam, ten miles northwest of the resort of Hua Hin (about 12° 40' N.), and an equal distance inland from the sea. The taking of a specimen of *Oriolus mellianus* here greatly extended the winter range of this fine species.

The fauna is typical of that of southwestern Siam, a not very well marked faunal area. In reality the fauna is that of central Siam, differing only in that a number of Malayan forms find, as might be expected, their northernmost limit there, in most cases differing slightly from more southern birds.

CHANUMAN.—Eastern Siam on the Me Kong River, north of the mouth of the Me Nam Mun (about $16^{\circ} 03' N.$, $15^{\circ} 04' E.$), and about 15 miles northwest of Kemraj. More properly spelled Channuman.

This region, including Khulu and Kemraj, supports a fauna closest to that of central Siam with naturally a strong influence from Indo-China. Virtually no birds from the strongly differentiated southeastern Siam area occur.

DOI PHA HOM POK.—A mountain (7532 ft.) on the Shan-Siam frontier, northeast of Chiang Dao.

HUA MAK.—Between Bangkok and Petriu.

KAPANG.—A town in the Province of Trang, peninsular Siam, on the railway from Tung Song to Trang. ($8^{\circ} N.$)

KEMRAJ.—On the Me Kong River at $16^{\circ} 02' N.$, $105^{\circ} 12' E.$ Usually spelled Kemarat, or Kemmarat.

KENG SOK.—Near Ban Thung Luang, but farther inland, near the base of the hills dividing Siam from Tenasserim.

KHAO BHANAM BENCHA.—A mountain (1386 m.) in Trang, on the western side of the peninsula, north of the town of Krabi. (A little N. of 8° .) Also spelled Khao Phanom Bencha.

KHAO LUANG.—A mountain (1247 m.) in the chain forming the boundary between Siam and Tenasserim at $11^{\circ} 40' N.$ in southwestern Siam. Not to be confused with Khao Luang, ($8^{\circ} 25' N.$) the well known locality near Nakon Sritamarat. Khao Luang simply means big mountain and it is commonly used in Siam for conspicuous peaks.

KHAO NOK WUA.—In the same range as Khao Luang, and just to the south of it ($11^{\circ} 30' N.$).

These two peaks, in the southern part of the faunal zone designated by Robinson and Kloss as Southwestern Siam, have a fauna typical of the region with but little influence from the south. They form the probable southern limit of *Gennaëus crawfurdi lineatus*, *Nyctiornis athertoni* and many other species. Here the northern *Microhierax caerulescens burmanicus* and the southern *M. fringillarius* meet, as do the northern and southern forms of *Dryocopus*, *javensis* and *feddeni*. The only two purely Malayan birds to reach the area, are *Malacopteron magnirostre magnirostre* hitherto known as far north as extreme southern Tenasserim and Chumporn, and *Arachnothera flavigaster* known as far north as Nakon Sritamarat. The securing of *Bubo nipalensis* at Khao Luang extends the range of that fine owl considerably to the southward. No collecting had been done before in the hills of this area, although Gyldenstolpe, in 1915, reached the foothills

behind Koh Lak (Prachuap Kirikan). He mentions Khao Luang as a high peak of 4800 ft. lying somewhat to the south of his collecting station at Hat Sanuk.

The collections from Khao Luang and Khao Nok Wua are disappointing in that they contain virtually no subtropical forms. My collectors noted on their labels an altitude of 3400 ft.; how they arrived at this figure I do not know, but my maps give the altitude as 1247 meters which is considerably below the 4800 ft. given by Gyldenstolpe (Kungl. Sv. Vet. Akad. Handl., 56, no. 2, p. 10, 1916).

KHAO SABAB.—A mountain (932 m.) about 10 miles east of Chantaboon (also spelled Chandhaburi) in southeastern Siam.

This locality, Chantaboon, Kratt and Khao Soi Dao, are in the area which shows the most marked endemism in Siam. Restricted to this southeastern corner are *Arborophila cambodiana diversa*, *Gennaues nycthemurus lewisi*, *Ducula badia obscurata*, *Harpactes erythrocephalus klossi*, *Pycnonotus cafer deignani*, *Pomatorhinus schisticeps klossi*, *Garrulax ferrarius*, and many others. Of course some are found across the border in Cambodia, and others, which so far have not been detected, undoubtedly will be found to occur there.

KHAO SOI DAO.—A mountain (1639 m.) about 25 miles due north of Chantaboon in southeastern Siam (13° N., 102° E.).

Not previously collected on. The fauna is that of southeastern Siam. Not to be confused with Khao Soi Dao, west of Singgora, in southern peninsular Siam.

KHULU.—Due north of Ubon, between that town and Kemraj, extreme eastern Siam (15° 35' N., 104° E.).

KRATT.—A town near the sea, in extreme south-eastern Siam near the Cambodian boundary. Also spelled Trat or Trad. Not to be confused with Korat in east central Siam.

ME RAMPAN.—Between Raheng and Sukhotai (lat. 17° 10' N., long. 99° 25' E.). On one map spelled Me Lambharn, but correctly Me Lam Phan.

ME POON.—A small tributary of the Me Yom which enters it at lat. 17° 40' N., long. 99° 42' E. More properly spelled Me Phun; on one map, Me Bhun.

NONG TAO.—Near Kapang, Trang.

PAKNAM.—At the mouth of the Me Nam Chao Phya, south of Bangkok.

PETRIU.—A town in central Siam, east of Bangkok, on the Bangpakong

river. Also spelled Pedriu, Petriew, Petrieu. It is also called Sha-jeungdhrao, Chachongsao, Chaxoensao, or Chaxernsao.

PRAN.—A town at the mouth of the Me Nam Pran, in southwestern Siam, about $12\frac{1}{2}^{\circ}$ N.

RAHENG.—A town on the Me Nam Ping just south of 17° N. In this region the central Siamese avifauna meets that of northern Siam. It appears on some maps as Tak.

RAYONG.—A town on the sea, just east of the inner gulf.

SRIRACHA.—A town on the east shore of the inner gulf. On some maps called Sri Maha Raja.

SRISAWAT.—A town in west-central Siam on the west bank of Me Klong ($14^{\circ} 40' \text{ N.}, 99^{\circ} \text{ E.}$). The country is wild, hilly and unhealthy.

This is the only region from which undoubted *Garrulax leucolophus belangeri* is recorded in Siam. The fauna is of course predominantly central Siamese. The hills which rise on each side of the river are a direct continuation southward from Muleyit. This mountain lies just under 100 miles due north, but the hills about Srisawat are apparently not high enough to support a subtropical fauna such as that found on Muleyit.

TACHIN.—A town at the mouth of the Tachin River on the north shore of the inner gulf, west of Bangkok. Spelled on some maps Dhachin and also known as Samudh Sagorn.

WATERFALL, TRANG.—A 40 foot fall of the Trang River at Chong, 12 miles east of the town of Thap Thian or Trang. At the foot of the mountains separating the Province of Trang from that of Singgora (Songkhla). The well-known locality where Robinson and Kloss did much of their early Siamese work. ($7^{\circ} 30' \text{ N.}, 99^{\circ} 47' \text{ E.}$)

WAT PA.—At the headwaters of the Pasak River about 70 miles east of the important town of Pitsanulok. ($17^{\circ} \text{ N.}, 101^{\circ} \text{ E.}$). Collecting was also carried on on a nearby mountain called Khao Nam Poo (3500 ft.).

The fauna at this locality is predominantly central Siamese with a slight influence from the north and east. *Criniger tephrogenys annamensis* probably finds the western limit of its distribution here, as does *Parus major templorum*. Representatives of the fauna of northern Siam are *Psittacula himalayana finschi* and *Mixornis gularis sulphurea*.

Except for a few specimens collected by H. M. Smith in the valley of the Pasak river (Oct. 18-23, 1932), the area was ornithologically unknown.

*Annotated List of Birds***ARDEIDAE**

Ardea cinerea rectirostris Gould

♂, Kapang, December 31.

Butorides striatus javanicus (Horsfield)

♀, Wat Pa, October 5.

Ardeola bacchus (Bonaparte)

♂, Khao Nok Wua (2000 ft.), October 19; ♀, Wat Pa, October 8.

Both birds are in non-breeding plumage.

Gorsachius melanolophus melanolophus (Raffles)

♂, Srisawat, July 5; ♀, Khao Nok Wua (2000 ft.), September 24; ♀, Khao Sabab (3000 ft.), June 17; ♀, Khao Soi Dao (3000 ft.), May 15.

CICONIIDAE

Anastomus oscitans (Boddaert)

2 ♀, Khao Bhanam Benchha, September 19.

Dissoura episcopus episcopus (Boddaert)

4 ♀, Kapang, December 27, 28.

Leptotilos javanicus (Horsfield)

♂, Petriu, January 16.

I have often seen this species from the train window in the southern parts of peninsular Siam.

THRESKIORNITHIDAE

Pseudibis papillosa davisoni (Hume)

♂, Khao Bhanam Benchha, September 22; 2 ♂, Kapang, December 27, 28.

The soft parts of the male from the first mentioned locality are marked "Iris orange; beak gray with green; legs pink."

ANATIDAE

Dendrocygna javanica (Horsfield)

♂, Khao Bhanam Benchha, September 4.

Cairina scutulata (S. Müller)

♂, ♀, Nong Tao, January 9.

The iris of the female is marked as "yellow." (For the use of this generic name see Mayr and Delacour, *Wilson Bull.*, vol. 57, no. 1, p. 29, 1945.)

Anas crecca crecca Linnaeus

♂, Petriu, January 2.

A fine specimen in full plumage.

In my paper in these Proceedings for 1929, page 588, I recorded a female of *Mareca penelope* (Linnaeus) from Hua Takay. This was an error, for on reexamination the bird proves to be a female of *Dafila a. acuta* Linnaeus. The record should be corrected accordingly.

Aythya fuligula (Linnaeus)

♂, Petriu, January 3.

I know of no record for the occurrence of this species in Thailand. It is hardly an unexpected addition to the avifauna of the country. Although marked ♂, the specimen agrees with adult females of this species by having a white mark at the base of the culmen.

ACCIPITRIDAE

Aviceda jerdoni jerdoni (Blyth)

♂, Khao Luang (3400 ft.), August 26; ♂, Khao Nok Wua (2000 ft.), October 16.

A rare bird which has been recorded from few Siamese localities. It has been reported from the central, southeastern and peninsular (Trang) parts of the country, but as yet not from the north.

The soft parts are marked, "Iris deep yellow; bill black; legs white."

The August specimen is in fresh plumage, the one taken in October is very worn.

Aviceda leuphotes (Dumont)

2 ♂, ♀, Kapang, January 4; 2 ♂, ♀, Ban Thung Luang, January 14-23; ♂, Chanuman, January 20; ♂, Srisawat, July 7; ♀, Khao Nok Wua (2000 ft.), October 15; 2 ♀, Wat Pa, October 20.

The bird taken July 7 is in very worn plumage. Fall and winter birds are in fresh plumage.

The difference between males and females apparently has not been noted before. In our series from Thailand six birds marked as males all have a large area of white, sometimes mixed with silvery gray, on the outer webs of the apical portion of the secondaries. Seven birds noted as females lack this marking, and have the outer web of the secondaries black.

Pernis ptilorhynchus torquatus Lesson

♂, Khao Bhanam Benchu, August 2.

The measurements of this specimen are as follows: wing 407, tail 255, crest 52, tail-wing index 62.9, wing-tip 104 mm.

Pernis ptilorhynchus orientalis Taczanowski

♂, Kapang, December 29.

Measurements are as follows: wing 405, tail 256, crest 27 (no conspicuously lengthened feathers), tail-wing index 63.4, wing-tip 137 mm.

***Pernis ptilorhynchus gurneyi* Stresemann**

(Archiv für Naturges., Leipzig, 9, pt. 2, 1940, p. 168.)

♀, Khao Nok Wua, October 16.

This bird measures as follows: wing 380, tail 225, crest 37, tail-wing index 59 mm.

***Accipiter badius poliopsis* (Hume)**

♀, Khao Soi Dao (3500 ft.), May 9; ♂, Srisawat, July 2; ♂, Khao Luang (3400 ft.), September 5; ♂, Khulu, December 29.

***Accipiter trivirgatus indicus* (Hodgson)**

♀ imm., Ban Thung Luang, January 26.

***Accipiter virgatus gularis* (Temminck and Schlegel)**

♂ imm., Wat Pa, October 18.

***Butastur indicus* (Gmelin)**

♂, Ban Thung Luang, January 23.

***Butastur liventer* (Temminck)**

♀, Chanuman, February 8.

***Spizaetus nipalensis fokiensis* Sclater**

♂, Khao Luang (3400 ft.), August 28; ♂, Waterfall, Trang, October 15.

***Spilornis cheela bassus* (Forster)**

♀, Kao Soi Dao, (3500 ft.), May 9; ♂, Khao Sabab, June 23; ♂, Srisawat, July 9; ♂, Khao Nok Wua, September 30-October 17.

The wings of these specimens, in the order in which they are listed above, measure, 426, 424, 443, 426, 410 mm. Other specimens in the Academy's collection measure as follows: ♀, Sriracha, 422; ♂, Kratt, 410; ♀, Chiang Mai, 456; imm., no sex, Chiang Rai, 445 mm. The latter two are, of course, *burmanicus*.

Delacour gives wing measurements for a pair of Cambodian birds as ♂ 425, ♀ 435, for Annam 415-454 (six specimens), and one from Laos 450 mm.

Birds from southwest, central and eastern Siam average smaller than more northern examples but not enough to warrant the recognition of *floweri* Swann, as an intermediate race between *bassus* and *burmanicus*.

It might be well to record here a specimen which agrees with the description of *S. c. ricketti* Sclater, from Loi Mwe, Keng Tung, Southern Shan States. The bird is very pale, and has a wing of 481 mm. It is a female taken in February. Baker records it in Burma only from the northeast. In Indo-China it has been recorded from N. E. Tonkin.

FALCONIDAE***Microhierax caerulescens burmanicus* Swann**

3 ♂, 4 ♀, Srisawat, July 2-9; 3 ♂, ♀, Chanuman, January 7-February 1; ♂, Khao Nok Wua (2000 ft.), October 4; ♀, Khao Luang (3400 ft.), September 3.

Immature birds have the forehead and superciliaries orange-rufous and the throat white.

Khao Nok Wua and Khao Luang represent an extension southward of the range of this species.

***Microhierax fringillarius* (Drapiez)**

♀, Khao Luang (3400 ft.), August 24.

In view of the fact that this and the preceding species occur together at Khao Luang (3500 ft.) they must be regarded as distinct species; *fringillarius* cannot be regarded as a subspecies of *caerulescens* as was done by Chasen (Hdlst. Mal. Bds., 1935, p. 80). Of course, previously, the northern bird was not known to range so far to the south.

***Neohierax insignis harmandi* (Oustalet)**

♀, Kemraj, January; ♀, Khulu, December 25; 3 ♂, 2 ♀, Chanuman, January 13-February 13.

Easily distinguishable from *N. i. cinereiceps* by the almost white crown and upper mantle in the males, and the paler rufous of the same area in females.

This form is not included by Peters in his *Birds of the World* (vol. 1).

***Neohierax insignis cinereiceps* (Baker)**

2 ♂, Srisawat, July 4, 5.

***Falco severus severus* Horsfield**

♀, Wat Pa, October 18.

***Falco tinnunculus interstinctus* Horsfield**

♀, Pran, March 14.

PHASIANIDAE

***Rhizothera longirostris longirostris* (Temminck)**

2 ♂, ♀, Khao Bhanam Bencha (3500 ft.), August 14-26.

***Tropicoperdix charltonii charltonii* (Eyton)**

2 ♂, 2 ♀, Khao Bhanam Bencha, August 21-28.

***Tropicoperdix chloropus peninsularis* (de Schauensee)**

(*Notulae Naturae*, no. 82, 1941.)

♂ (type), Ban Thung Luang, January 20; 3 ♂, 2 ♀, Ban Thung Luang, January 11-23; 5 ♀, Khao Nok Wua (2000 ft.), September 22-October 4; 2 ♂, 3 ♀, Khao Luang (3400 ft.), August 21-September 13.

A pale form known only from the above localities.

***Tropicoperdix chloropus chloropus* Blyth**

2 ♂, 2 ♀, Kratt, December 2-5; 2 ♂, Khao Soi Dao (3500 ft.), May 17, 27; 2 ♂, Khao Sabab (3000 ft.), June 6, 13.

***Caloperdix oculea oculea* (Temminck)**

2 ♂, Khao Bhanam Benchha (3500 ft.), August 13, 18.

***Rollulus roulroul* (Scopoli)**

5 ♂, 4 ♀, Khao Bhanam Benchha (3500 ft.), August 4-September 16.

A juvenile female, taken September 11, has the entire head rufous, the lower surface dark grayish brown spotted with dull rufous; the upper mantle mouse-color, the rest of upper surface green; wing-coverts rufous, vermiculated with black and spotted with buff; remiges dark brown; rectrices mouse-color.

***Gennaesus crawfurdi lineatus* (Vigors)**

♂, Raheng, May 18; 3 ♂, Khao Luang (3400 ft.), August 8-September 8; ♂, Khao Nok Wua (2000 ft.), October 6.

The soft parts of two adult males from Khoa Luang are marked as follows: "Iris chestnut; bill blue-green; legs blue-green" in the other, "Iris chestnut; bill blue-green; legs red."

In the bird from Raheng (collected in 1938) the legs appear dark. In the skins of the three from Khao Luang, two have ruby-red legs and feet, while the third, marked on the label as having blue-green legs and feet, has them yellowish in the skin. The Khao Nok Wua bird has the legs in the skin ruby-red. All the birds are fully adult with the exception of the Raheng specimen which is very nearly so. It still retains the wing feathers of the immature stage.

Khao Nok Wua is a slight extension southward of the range of this form and must be at the southern limit of its distribution.

***Lophura diardi* (Bonaparte)**

2 ♂, Wat Pa, October 19, 31; ♂, Rayong, October 16.

***Lophura ignita rufa* (Raffles)**

♂, ♀, Khao Bhanam Benchha (3500 ft.), August 26, September 5.

***Gallus gallus gallus* (Linnaeus)**

♂, ♀, Khao Nok Wua (2000 ft.), October 2, 6; ♂, ♀, Kapang, December 31, January 2.

***Polyplectron malacensis* (Scopoli)**

3 ♂, 2 ♀, Khao Bhanam Benchha (3000 ft.), August 15-22.

Deignan (Bull. 186, U. S. Nat. Mus., 1945, p. 98) records two specimens of *P. b. bicalcaratum* (Linnaeus) as known from northern Siam, one from Koon Tan, now in Stockholm, and one from Doi Pha Hom Pok in the Academy. The Academy, however, has two birds, both males, from the latter locality.

***Argusianus argus argus* (Linnaeus)**

♂, Khao Bhanam Benchha, August 8; ♂, Waterfall, Trang, October 10.

TURNICIDAE

Turnix suscitator interrumpens Robinson and Baker

♂, Pran, March 19.

Turnix tanki blanfordii Blyth

♀, Chanuman, January 17.

RALLIDAE

Rallus aquaticus indicus Blyth

♂, Paknam, March 22.

Porzana fusca bakeri Hartert

7 ♂, 4 ♀, Paknam, March 5-22.

The wings of this series measure ♂, 102, 103, 107, 108, 110, 110, 114; ♀, 100, 106, 107, 108 mm.

All of these birds, with the exception of one (wing 114 mm.) fall within the range of wing length attributed to *bakeri*. The large bird, according to its wing length should be *erythrothorax*, but it agrees perfectly with the rest of the series in color and had best be regarded as an abnormally large *bakeri*.

A series of *P. f. erythrothorax* (Temminck and Schlegel) from Japan measures ♂, 111, 114; ♀, 107; o, 109, 112, 113, 115, 117 mm.

The only color difference between the two forms which I can perceive is that the fore-crown in three comparably fresh specimens from Japan are considerably lighter chestnut. This combined with average larger size serves to distinguish *erythrothorax* from *bakeri*.

CHARADRIIDAE

Lobivanellus indicus atronuchalis Jerdon

2 ♀, Khao Nok Wua (2000 ft.), October 15; ♂, ♀, Kratt, November 30; 2 ♂, Chanuman, January 9; 2 ♂, Khulu, December 22; 2 ♀, Pran, March 16, 18.

Hoplopterus duvaucelii (Lesson)

♂, Keng Sok, March 3; 3 ♂, 2 ♀, Srisawat, July 15; ♂, 2 ♀, Chanuman, January 29-February 10.

Pluvialis dominica fulva (Gmelin)

3 ♂, 2 ♀, Rayong, October 10-24; ♀, Paknam, October 4; 4 ♀, Kapang, December 31-January 3.

Charadrius leschenaultii Lesson

2 ♂, o, Rayong, October 10-November 10; ♀, Tachin, October 11; o, Rayong, November 10.

Charadrius mongolus schäferi de Schauensee

Proc. Acad. Nat. Sci. Phila., vol. 89, 1937, p. 340, (100 miles N. of Jeykundo, S. Kononor).

♂, ♀, Tachin, September 9, 25; 2 ♀, Rayong, October 10, 23.

Although in winter plumage, I believe these birds to represent *schäferi*. They have the large bill of *atrifrons*, but are darker on the back than that form.

SCOLOPACIDAE**Numenius phaeopus variegatus** (Scopoli)

2 ♂, Paknam, October 3.

One is typical of *variegatus*, the other equally typical of *phaeopus*. The latter has lightly barred axillaries, unbarred flanks and undertail coverts, white instead of barred rump, and white, unstreaked throat.

Numenius arquata orientalis Brehm

♂ (?), Paknam, October 3.

The exposed culmen is no less than 194 mm. Hartert (Vog. Pal. Fauna, II, p. 1644) gives 184 mm. as the maximum for old females.

Tringa totanus eurhinus (Oberholser)

3 ♀, Tachin, September 24-26.

Two are in worn breeding plumage, the third in almost complete winter plumage.

The three birds measure 147, 153, 159 mm. as against eleven breeding birds from Jeykundo, southern Kokonor, 153-168 mm.

Tringa stagnatilis (Bechstein)

2 ♂, 3 ♀, Tachin, September 23-27.

Tringa glareola Linnaeus

3 ♂, Paknam, September 30, October 4; ♀, Tachin, September 27; ♀, Kapang, December 31.

Actitis hypoleucos (Linnaeus)

♂, 3 ♀, Paknam, October 4; ♂, Rayong, October 10; ♀, Kemraj, January 2.

Erolia ruficollis (Pallas)

2 ♂, Tachin, September 24.

Erolia subminuta (Middendorf)

♀, Tachin, September 24.

Erolia testacea (Pallas)

2 ♂, ♀, Paknam, September 23-October 3.

RECURVIROSTRIDAE

Himantopus himantopus himantopus (Linnaeus)

♀, Tachin, September 29, "Iris reddish; bill black; legs pink."

LARIDAE

Chlidonias hybrida javanica (Horsfield)

2 ♂, Tachin, September 23, 26.

The bird taken on September 26 is in breeding plumage, the one collected on the 23rd is immature with traces of brown on the mantle and tertials.

The female from Pra Kanong recorded by me (Proc. A.N.S.P., 87, 1934, p. 278) as belonging to this species, on reexamination proves to be a specimen of *Chlidonias leucoptera* (Temminck). It was collected on January 16.

COLUMBIDAE

Butoreron capellei magnirostris (Swainson)

2 ♂, 7 ♀, Khao Bhanam Bencha, September 7-21.

I have no western Java birds for comparison.

Treron curvirostra curvirostra (Gmelin)

2 ♂, ♀, Khao Bhanam Bencha (3500 ft.), August 30-September 11; ♂, ♀, Khao Luang (3400 ft.), August 6; ♀, Khao Nok Wua (2000 ft.), October 16.

Birds from these localities are duller in color than birds from farther north, agreeing better with a Sumatra bird and one from the "Malay Peninsula." They also average smaller than northern birds.

The soft parts of a male from Khao Luang are recorded as, "eyes deep yellow; bill yellow-green; legs pink."

Treron curvirostra nipalensis (Hodgson)

♂, 2 ♀, Khao Sabab (3000 ft.), June 17-23; ♀, Kratt, December 7; 2 ♂, Khulu, December 19, 20; ♂, 3 ♀, Chanuman, February 4-13; ♀, Srisawat, July 9; 2 ♂, Wat Pa, October 22, 23.

Measurements of our specimens are as follows: Nakon Sritamarat, ♀, 143; Khao Bhanam Bencha, ♂, 132, 137, ♀, 129; Khao Luang, ♂, 139.5, ♀, 131; Khao Nok Wua, ♀, 143; Srisawat, ♀, 139; Sriracha, ♀, 134; Wat Pa, ♂, 137, 145, 148; ♀, 140; Bua Yai, ♂, 143; Chanuman, ♂, 146, ♀, 141, 144, 146; Khulu, ♂, 146, 153; Khao Sabab, ♂, 144, ♀, 137, 144; Kratt, ♀, 152; Chantaboon, ♂, 141; Ban Cheong Mts. ♂, 154 mm.

Treron pompadora phayrei (Blyth)

2 ♂, Wat Pa, November 1, 6; 2 ♂, 2 ♀, Kratt, November 28-December 6.

Treron olax olax (Temminck)

3 ♂, Khao Bhanam Bencha, September 7-18.

Treron bicincta bicincta (Jerdon)

2 ♂, Ban Thung Luang, January 18, 22; 2 ♂, 2 ♀, Khao Luang, August 12-September 3.

I have seen no Indian material, and follow Peters in synonymizing *prae-termissa* described from Koh Lak, S. W. Siam, by Robinson and Kloss.

Treron phoenicoptera viridifrons Blyth

2 ♂, 3 ♀, Srisawat, June 23-July 15.

A young bird agrees with the description of *Sphenocercus pseudo-crocopus* Gyldenstolpe in having no hollowed-out area on the inner web of the third primary and unattenuated tips to the primaries. Another specimen, somewhat older, has the primaries attenuated, but the inner web of the third primary entire. Both of these have the yellow of the abdomen running well up onto the chest instead of confined to the belly as in older birds, as is shown in the figure of the type of *pseudo-crocopus* (Kunzl. Sv. Vet. Akad., Band, 56, no. 2, 1916, pl. 3).

These two, both females, measure 151 (the least mature of the two), 174; the others, adults, measure ♂, 174, 175, ♀ 176 mm. More northern examples are larger; they measure, Sanmakapon (near Chiang Mai) ♂, 185, 185, 195, ♀, 182. A male from Kyundaw near Mt. Victoria, Burma, has a wing of 189 mm. A female from Central Siam (Me Rampan) again is small; its wing measures 173.5 mm. and agrees with birds from Srisawat. The only one of the more southern birds which is in comparable plumage to that of the northern birds is the female from Me Rampan. This bird is darker on the back than the northern birds.

Viridifrons was described from the Tenasserim provinces, and one should see birds from there before deciding whether the larger or smaller birds represent that form. From my material it appears that Siam is perhaps inhabited by two races.

Neither I nor Deignan have seen birds from Annam (*annamensis* Ogilvie-Grant) but for remarks on this form see Deignan in the Bull. U. S. Nat. Mus., no. 186, 1945, p. 147, in which he believes it probable that *annamensis* is based on nothing more than *viridifrons* in fresh plumage.

Ducula aenea sylvatica (Tickell)

♀, Srisawat, July 2; 2 ♂, ♀, Ban Thung Luang, January 16-18; ♂, Khao Nok Wua (2000 ft.), October 6; ♂, Kemraj, January 5; ♂, Chanuman, January 28; ♂, Khao Soi Dao, (3500 ft.) May 9.

Ducula badia obscurata Conover

2 ♂, Kratt, November 29, December 9. Both are immature.

Columba punicea Blyth

♂, 2 ♀, Khao Luang (3400 ft.), September 6-9.

The soft parts in the adult female are marked "eyes deep yellow; beak red with white tip; legs red."

The other female is immature and differs from the adult by having the forehead and sides of head vinaceous gray and the crown vinaceous, which in the adult are pale lavender-gray; lower surface dull gray the feathers edged with rufescent; hind neck, upper mantle and upper tail coverts gray, center of back gray, the feathers broadly edged with rufous.

The adult female differs from an adult female from the Attaran Valley, Burma, by having the rump and upper tail coverts much grayer, the head purer lavender-gray and the lower parts more richly colored.

Streptopelia orientalis agricola (Tickell)

2 ♂, Chanuman, February 11.

The wings of these two adult birds measure 181, 181.5 mm., vs. 190-202 mm. for eighteen adults of *orientalis* from China and Tibet.

In color the Chanuman birds are slightly darker, especially the gray of the rump and upper tail-coverts, and the vinaceous of the mantle. Delacour refers all birds from Indo-China to the typical form (Ois, 1940, p. 116), but these two appear to differ sufficiently not to be grouped with them. I have, however, seen no Indian specimens of *agricola* and merely follow the general usage of the name *agricola* for southern birds.

Streptopelia chinensis tigrina (Temminck)

♀, Srisawat, July 12; 3 ♂, 2 ♀, Wat Pa, October 6-28; ♂, Khao Bhanam Bencha, September 16.

Continental birds appear to average considerably larger than birds from Java, Sumatra and Borneo. The wings of insular birds measure as follows: Java ♂, 142, 143, ♀ 139, 143, 144; Sumatra ♀, 140, 141.5, 148, not sexed, 135, 142; Borneo ♀, 141. Siamese examples measure as follows: ♂ 145, 148, 149, 150 (4), 151 (2), ♀ 144.5, 148, 153. Mayr for Chindwin birds gives ♂ 145-153, ♀ 142 (Ibis, 1938, p. 317). Four typical *tigrina* measured by Peters had wings of 133-142 (Bds. Wld., III, p. 98, footnote 1).

Streptopelia tranquebarica humilis (Temminck)

♂, ♀, Wat Pa, October 5, 6; ♂, Khao Nok Wua, (2000 ft.), October 21.

Chalcophaps indica indica (Linnaeus)

♂, Wat Pa, October 9; 2 ♂, ♀, Srisawat, July 3-7; ♂, Ban Thung Luang, January 1; ♀, Khao Nok Wua (2000 ft.), September 27; 3 ♂, Khao Bhanam Bencha (3500 ft.), August 15, 16; ♀, Kratt, December 7; ♀, Khao Soi Dao (3500 ft.), May 24; 3 ♂, Khao Sabab, June 6-13.

A juvenile male was taken August 15 at Khao Bhanam Bencha. Below it is barred black and rufous, while above emerald green feathers are appearing on the back and wing coverts. The forehead only is pearly gray.

PSITTACIDAE

Psittacula eupatria siamensis (Kloss)

♂, 5 ♀, Chanuman, January 14-February 10.

Psittacula alexandri fasciata (Müller)

♂ juv., Srisawat, July 12; ♂, Kemraj, December 29; 3 ♂, 5 ♀, Chanuman, January 10-February 16; ♂, Khulu, December 19; ♂ ad., 6 ♂ juv., Khao Soi Dao, (3500 ft.), May 10-30; ♂, 2 ♀, 5 ♀ imm., Khao Nok Wua (2000 ft.), October 10-21; ♂, Ban Thung Luang, January 13; Khao Luang, 4 ♂, ♀ imm., September 6-9.

Juvenile males with the forehead and cheeks sandy gray, diffused dusky moustachial streak and green breast have both culmen and mandible red to dusky red; females of comparable age have the entire bill black. Adult males have the culmen red and mandible black, but it is interesting to note that the adult male of the Javanese form (*alexandri*) has both the culmen and mandible red, perhaps the more primitive coloration. One adult male of *fasciata* from Chiang Rai has the bill entirely red but it is the only one among fourteen males to show this deviation.

Psittacula cyanocephala rosea (Boddaert)

♂, 2 ♀, Srisawat, June 28-July 3; 5 ♂, Chanuman, January 1-February 11; 4 ♂, ♀, Khao Nok Wua, September 30-October 1; 10 ♂, 3 ♀, Khao Luang, September 1-8.

The soft parts of an adult male from Khao Luang are noted as, "Eyes light yellow, beak upper orange, lower black with green (? tinge); legs gray." A female from the same locality had the "eyes white; beak upper deep yellow, lower grayish green, legs light gray."

Psittacula himalayana finschii (Hume)

3 ♂, ♀, Wat Pa, October 24-30.

I believe this is the southernmost record of the species for Siam.

Psittinus cyanurus cyanurus (Forster)

♂, Khao Bhanam Bencha, August 4.

Loriculus vernalis vernalis (Sparmann)

♂, ♀, Wat Pa, November 2; 7 ♂, 4 ♀, Khao Soi Dao (3500 ft.), May 5-30; ♂, Chanuman, February 1; ♂, 2 ♀, Khao Bhanam Bencha, September 4-6.

CUCULIDAE

Clamator coromandus (Linnaeus)

♂, Pran, March 19; ♀, Hua Mak, December 27; ♀, Chanuman, January 29; ♂, ♀, Khao Nok Wua, October 5, 11.

Cuculus sparverioides sparverioides Vigors

♀, Kratt, December 7.

Cuculus fugax nasicolor Blyth

♀, Khao Nok Wua (2000 ft.), September 9.

The soft parts are marked, "Iris very light brown; beak greenish yellow with black tip; legs orange color."

The small bill of this specimen places it as the migrant form. The wing measures 182. The wing-tip index is 29.1 mm., which is slightly shorter than that given by Mayr.*

Penthoceryx sonneratii sonneratii (Latham)

♀, Srisawat, July 10; 2 ♂, Chanuman, January 24, February 18.

The wings of these birds measure ♂ 122, 128.5, ♀ 119 mm.

Penthoceryx sonneratii malayanus Chasen and Kloss

♂, ♀, Khao Luang (3400 ft.), August 21, 23; 2 ♂, Khao Bhanam Bencha (3500 ft.), August 22, September 13.

The wings of these birds measure in the order in which they are listed above 116, 116, 115, 115 mm. A male from Nakon Sritamarat has a wing of 114 mm.

These birds are intermediate in size between this race and *sonneratii*. They average slightly darker, however, than more northern birds.

Cacomantis merulinus querulus (Heine)

♀, Khao Soi Dao (3500 ft.), May 16; ♂, Waterfall, Trang, October 10.

Chalcites xanthorhynchus xanthorhynchus (Horsfield)

♂, Srisawat, July 13; ♀, Keng Sok, March 11; ♀, Kratt, December 7; ♂, Khao Soi Dao (3500 ft.), May 12.

Adult males in the Academy's collection from Sumatra measure 98, 100 mm. The male from Srisawat has a wing of 102, and two males assuming adult plumage from Khao Soi Dao, and Sriracha have wings of 101.5, 102 mm. Deignan (Bull. U. S. Nat. Mus., 186, 1945, p. 165) recognizes *limborgi* (Tweeddale) for continental specimens on the basis of longer wings. Four Sumatran males measured by him had wings of 92.6-95.4 mm. In view of the fact a male from Goenong Sugi, Lampongs, Sumatra, measures up to 100 mm., I feel more material, particularly Javanese, should be examined before reinstating *limborgi*.

It is curious how rare this bird is in northern Siam. I have never seen it there, and Deignan (l. c.) records but two specimens. In other parts of Siam, although not common, it appears to be rather frequently met with. *C. maculatus*, while by no means common in northern Siam, is at least occasionally seen, but strangely, we have only one specimen from southern Siam (Bangkok) where *xanthorhynchus* is apparently the more usual. The range of the two species on continental Asia is more or less alike, from northern India to the Malay Peninsula. It would be interesting to know what factors virtually exclude one species where the other is present.

* Bull. Raff. Mus., 14, 1938, p. 24.

Surniculus lugubris dicruroides (Hodgson)

♀, Kratt, December 9; ♂, ♀, Keng Sok, March 12; ♂, Waterfall, Trang, October 4.

The wings of these birds measure in the order given above 136, 137, 134, 140, the tails 123, 131, 128.5, 132 mm. All these are clearly referable to *dicruroides* rather than to *barussarum*. The Trang bird is probably a migrant. A specimen from Nakon Sritamarat is referable to *barussarum* for it measures ♀, wing 123, tail 100 mm. A series of this subspecies in the Academy's collection from the Batu Islands measures, wings ♂, 115, 119, 120, ♀, 124, 125, tail ♂, 99, 103, 104, ♀, 109, 113 mm.

Surniculus lugubris barussarum Oberholser

♂, Khao Luang (3400 ft.), August 25.

In size this specimen (wing 128, tail 114 mm.) fits best with *barussarum*.

From the above it appears that the territory of this form is invaded by the larger northern form during the winter months. Chasen, however, says (Bds. Mal. Pen., IV, p. 138) that *dicruroides* is resident in the mountains.

Eudynamis scolopacea subspecies

3 ♂, 3 ♀, Wat Pa, October 6, 7; ♂, Chanuman, February 8.

I cannot discover what the difference between *malayana* and *chinensis* is. *Malayana* is supposed to be a larger bird than *chinensis*, but published measurements do not support this fact. For *chinensis* La Touche gives the following measurements, wings ♂, 190-210, ♀, 182-190, culmen 30-33 mm. (Hdbh. Bds. E. China, vol. II, p. 55). Delacour for the same form gives wing 188-221, culmen 32-34 mm. (Ois. Indo-Chine Fr., vol. II, p. 183). For *malayana* Robinson gives wing 197-216, culmen from gape 39-44 mm. (= about 29-34 mm. culmen measurement).

Specimens in the Academy's collection measure as follows:

Wing Culmen				Wing Culmen			
♂	Yachow, Szechwan	.....	213 26	♂	Keng Koi, Siam	.....	29
♂	Mt. Victoria, Burma	.....	206 ..	♂	Keng Koi, Siam	.....	27
♂	Wat Pa, Siam	.....	198 25	♂	Nakorn Nayok, Siam	.....	28
♂	Wat Pa, Siam	.....	204 28.5	♀	Bangkok, Siam	.....	29.5
♂	Wat Pa, Siam	.....	211 27	♂	Koh Tao, Siam	.....	29.5
♀	Wat Pa, Siam	.....	202 28.5	♂	Labuan, Borneo	.....	25
♀	Wat Pa, Siam	.....	202 28.5	♂	Pulo Tello, Batu Is.	.....	31.5
♀	Wat Pa, Siam	.....	202 29	♂	Pulo Tello, Batu Is.	.....	29.5
♀	Wat Pa, Siam	.....	205 27	♂	Pulo Tello, Batu Is.	.....	218 29.5
♂	Me Rampan, Siam	.....	204 25.5	♂	Pulo Tello, Batu Is.	.....	220 32
♂	Me Rampan, Siam	.....	207 27	♀	Pulo Tello, Batu Is.	.....	208 29
♂	Chanuman, Siam	.....	212 30.5	♀	Pulo Tello, Batu Is.	.....	211.5 29
♂	Bua Yai, Siam	.....	206 25.5	♀	Pulo Tello, Batu Is.	.....	213 30
♂	Keng Koi, Siam	.....	209 28.5	♀	Pulo Tello, Batu Is.	.....	221 32

It is true that Batu Island birds average larger than more northern examples but I do not believe that they properly represent *malayana*. It is well known that birds from the islands off the west coast of Sumatra are

apt to be larger than birds from the adjacent areas, and as a matter of fact a male from Pulo Babi has a culmen of no less than 36 mm. (vide Ripley, Bull. Mus. Comp. Zool., 94, 1944, p. 346).

The forms of this species should be revised before subspecific identification, certainly of mainland birds, is undertaken.

Rhopodytes diardi diardi (Lesson)

2 ♂, 2 ♀, Khao Bhanam Benchra (3500 ft.), August 3-27.

The soft parts of a female are recorded as, "eyes dark brown; beak dark green; legs dark gray."

Birds from peninsular Siam appear to have slightly longer tails than Sumatran birds. The tails of two males from Trang measure 221, 224, two females 219, 224. Deignan writes me that peninsular material in the U. S. National Museum measures as follows: Singapore (type of *nigriventris* Peale) 221, "Malacca" 226, Patani 220, Trang 235 mm.

An unsexed series of six birds from eastern and southeastern Sumatra have tails of 204, 207, 209, 211, 216, 220; a female from Atjeh 211, a bird from Tarussan Bay (U.S.N.M.) 213, and another from Tapanuli Bay (U.S.N.M.) 212 mm.

Chasen (Bds. Mal. Pen., IV, p. 155) gives the tails of Malayan specimens as 218-227 mm.

No conclusion can be based on the above material as most of it is unsexed, but it seems worth while to call attention to the divergence in tail measurements between birds from Malaya and Sumatra.

Rhopodytes sumatranus sumatranus (Raffles)

2 ♂, Kapang, January 4.

A single specimen from Banka differs from the above two by being somewhat darker below, and having the black of the lores continued over the eye in the form of a narrow line. In Siamese specimens this line is white. I have seen no Sumatran birds.

Rhopodytes tristis longicaudatus (Blyth)

2 ♂, ♀, Wat Pa, October 10-23; ♀, Khulu, December 21; 2 ♂, Khao Sabab (3000 ft.), June 18, 24; ♂, ♀, Srisawat, July 5; ♀, Rayong, October 1; ♂, 2 ♀, Kratt, November 27, December 4; ♂, Ban Thung Luang, January 22; ♂, ♀, Khao Luang, August 5, September 21.

The measurements of Siamese birds from north to south are as follows: wings are given first, then tails. Pha Hom Pok, ♂, 163, 368, ♀, 165, 397; Chieng Dao, Chieng Mai, ♂, 157, 157, 157, 159, 160, 160, 162, 165, 335, 353, 360, 365, 368, 375, 384, 395, ♀, 153, 156, 158, 343, 355, 372; Wat Pa, ♂, 158, 165, 382, 384, ♀ 155, 375; Srisawat ♂ 156, 164, 308, 366 (worn), ♀ 158, 362 (worn); Kon Ken, ♂, 160, 335; Keng Koi, ♀, 162, —; Khulu, ♀, 160, 358; Rayong, ♀, 158, 421; Kratt, ♂, 160, 310, ♀, 152, 165, —, 400;

Khao Soi Dao, ♂, 163, 300; Khao Sabab, ♂, 160, 325; Ban Thung Luang, ♂, 162, 348; Khao Luang, ♂, 150, 290, ♀ 160, —.

Extreme measurements for males are wing, (150 once), 156-165, tail (290 once) 308-395; female's wing 152-165, tail 300-397 mm. (421 once).

Wat Pa birds have a little less white at the tips of the tail feathers, thus verging toward *saliens* Mayr. Birds from Chiang Mai and Chiang Dao are also intermediate.

Rhinortha chlorophaea chlorophaea (Raffles)

♂, 2 ♀, Khao Luang (3400 ft.), August 5, 8; 4 ♂, Khao Bhanam Bencha (3500 ft.), August 12-September 14; 2 ♂, 2 ♀, Waterfall, Trang, October 3-7.

Zanclostomus javanicus pallidus Robinson and Kloss

♀, Khao Bhanam Bencha, August 10.

Centropus sinensis intermedius (Hume)

♂, ♀, Chanuman, January 13; ♂, Khao Sabab, (3000 ft.), June 21; ♂, Kratt, December 2.

In the Academy's collection is a specimen of the rare *C. rectunguis* Strickland from the collection of Prince Momfanoi, marked "Siam." Of course many years ago when this collection was made Siam extended farther south down the Malay Peninsula, and doubtlessly this specimen must have come from what today are the Malay States.

TYTONIDAE

Phodilus badius badius > *saturatus*

♀, Khao Luang (3400 ft.), August 6.

The wing of this specimen measures 212.5 mm. A female in Stockholm from Koon Tan has a wing of 215 mm. (*vide* Deignan), and Greenway's male from Doi Nan Keo has a wing of 210 mm. A female from Hue Nya Pla, near Raheng measured by Chasen and Kloss (Journ. Siam. Soc., VII, 1928, p. 163) has a wing of 218 mm. A female from Mt. Dulit, Borneo has a wing of 185 mm. A female from Blangnanga, Atjeh, Sumatra, and a male from Nias both have wings of 189 mm. Another female from Brastagi, Sumatra, is too worn to measure. Baker for Java and Borneo birds gives 175-197 mm. as wing measurements, and for Burma 192-211 mm. *Saturatus*, according to the same authority measures 214-237 mm. For Malay States birds Robinson (Bds. Mal. Pen., II, p. 35) records the wings as 7.4-8 in. (= 188-203 mm.). A bird from Singapore measured by Kuroda had a wing of 177 (? ♂, Bds. Java, II, p. 496).

In color my bird is paler than the two examples from Sumatra, and the one from Nias. As Deignan has said, it is probable that Prov. Wellesly is too far south for Oberholser's *abbotti* to be applicable to a race intermediate

in size between *baduus* and *saturatus* if more material shows the necessity for separating Siamese and Burmese birds.

STRIGIDAE

Otus sagittatus Cassin

♀, Ban Thung Luang, January 20.

Cassin's type of this rare owl is in the Academy's collection. It is marked "Malacca" as are two other specimens examined by Cassin. The wing of the type measures 180 mm., that of the other adult 181 mm. The Ban Thung Luang specimen measures 186 mm.

Otus asio condorensis Kloss

♂, Khao Luang, September 3.

Bubo nipalensis nipalensis Hodgson

♀, Khao Luang, (3400 ft.), September 8.

I believe that this is the southernmost record for this owl.

In measurements it is much smaller than those given by Baker and Delacour for this form, wing 404, tail 215, culmen 47 vs. wing, 425-470, tail, 229-250, culmen 52-54.

From an Himalayan specimen in the Academy's collection it differs by having a white "face," and the tertials white, barred at intervals of about 18 mm. by dark brown bands 5 mm. wide (? immaturity).

Our Himalayan specimen has a wing of 435, tail 229, culmen 54 mm.

Further specimens may show that peninsular Siam is inhabited by a small race of this large owl.

Ketupa zeylonensis Ileschenault (Temminck)

♂, Khao Luang (3400 ft.), September 4; ♂, Kapang, January 2; ♀, Khao Bhanam Bencha, September 18; ♂, Khao Sabab (3500 ft.), June 15.

Ketupa ketupu aagaardi (Neumann)

♂, Khao Nok Wua (2000 ft.), September 30; 2 ♂, Waterfall, Trang, October 3, 8; ♂, Khao Bhanam Bencha, September 11.

Glaucidium cuculoides brügeli (Parrot)

♀, Kemraj, December 31; ♂, ♀, Chanuman, January 3-22; 2 ♂, ♀, Wat Pa, October 13-31; 3 ♂, 3 ♀, Srisawat, June 29-July 4; 2 ♂, Ban Thung Luang, January 10-25; 2 ♂, ♀, Khao Luang (3400 ft.), August 18-September 15.

Glaucidium brodiei brodiei (Burton)

♀, Khao Soi Dao, (3500 ft.), May 2; ♂, Ban Thung Luang, January 22; ♂, ♀, Khao Luang (3400 ft.), August 28.

Ninox scutulata malaccensis (Eyton)

♂, Ban Thung Luang, January 13; ♀, Khao Bhanam Bencha, September 17.

The record from Ban Thung Luang extends the range of this form northward. The bird is quite typical of *malaccensis*, and agrees with a small Sumatran series. Its wing measures 202 mm.

***Strix leptogrammica maingayi* (Hume)**

♂ juv., Khao Luang (3400 ft.), August 10; ♂, Khao Bahnam Benchha, August 17.

We have no comparative material. Birds from Trang have been named *rileyi* by Kelso.

PODARGIDAE

***Batrachostomus stellatus* (Gould)**

♂, ♀, Khao Bhanam Benchha (3500 ft.), August 14, 19.

The soft parts of the male are marked, "eyes yellowish; beak light brown; legs yellowish pink."

***Batrachostomus javensis continentalis* Stresemann**

♂, Khao Luang (3400 ft.), August 24.

The soft parts are marked, "eyes yellow; bill brownish green; legs brownish green."

CAPRIMULGIDAE

***Eurostopodus macrotis cerviniceps* (Gould)**

♀, Khao Sabab, June 13; ♂, ♀, Ban Thung Luang, January 16-19; ♂, Khao Bahnam Benchha, September 15.

***Caprimulgus macrurus ambiguus* Hartert**

2 ♀, Kratt, November 30-December 10; ♂, Chanuman, February 8; ♂, ♀, Keng Sok, March 12; ♂, Pran, March 17; ♂, Ban Thung Luang, January 25; 2 ♂, ♀, Khao Nok Wua (2000 ft.), September 21-27; ♂, Khao Bhanam Benchha, September 11.

Specimens from northern and central Siam were taken during October, November, December, January, February and March.

Birds here listed have wings measuring as follows: ♂, 190, 195, 200, 201, 202, 202, 205, ♀, 190, 194, 198, 198.5 mm. A male from Mt. Victoria, and another from Dudaw-Taung, Chinn Hills, have wings of 202, 203 mm. Another male from Tongolo (just east of Ta-Tsien-lu, Szechwan, October 23) has a wing of 189.5 mm. This bird was listed by Stone (Proc. A.N.S.P., 85, 1933, p. 184) as *C. indicus jotaka*, Temminck and Schlegel, and the record should be corrected, especially as the bird does not seem to have been recorded before so far north in China. It is possible that this specimen should be referred to *albonotatus* but it is a dark individual which seems to fit in our Siamese series. Further it is very small, too small apparently for *albonotatus*, the wing of which is given by Baker as 205-223 mm. for northeast India birds.

A pair from Medan, Sumatra, customarily referred to *bimaculatus* Peale, have wings measuring, ♂, 192, ♀, 201, and in color do not differ from a Siamese series. One wonders whether *ambiguus* is really separable from *bimaculatus*, but unfortunately we do not have Malay States material to settle the question. The type of *bimaculatus* has a wing of 198 mm.* and three males from Singapore measure 185-191 mm. (*vide* Riley, Bull. 172, 1938, p. 154). Mayr (Ibis, 1938, p. 310) gives the wings of *bimaculatus* measured by him as 192, 194, 198, 203 mm.

Caprimulgus asiaticus siamensis de Schauensee

♂, Pran, March 14; ♀, Khao Luang (3400 ft.), September 8.

The soft parts of the Khao Luang bird are marked, "eyes dark brown; beak dark gray; legs light gray."

The taking of a bird at Khao Luang extends the range of this form slightly to the southward.

Caprimulgus affinis stictonomus Swinhoe

♂, Kratt, December 3.

I believe Deignan to be quite right in attaching *monticolus* and its forms to *affinis* (Bull. 186, U. S. Nat. Mus., 1945, p. 187). Stresemann pointed out to Rothschild (Nov. Zool., 33, 1927, p. 398) that they should be so considered.

The present bird is much grayer than other specimens from Siam, and as it answers to the description of this form, and as Delacour records it as the only one to inhabit nearby Indo-China, I have recorded it as above. Birds from other parts of Siam are much more rufescent, especially one from Nakon Nayok, which agrees with the description of *amoyensis* Baker. *Caprimulgus affinis stictonomus* has not previously been recorded from Siam.

Five Indian specimens (*monticolus*) in the Academy's collection, agree with our Siamese birds (the Nakon Nayok specimen excepted) when due allowance is made for the difference in age between the two series. Ticehurst (Ibis, 1939, p. 32) does not recognize *burmanicus* Baker as distinct. Whether the Nakon Nayok bird represents an extreme rufous phase of *monticolus* or a migrant *amoyensis* I do not know. It was taken November 6.

APODIDAE

Cypsiurus parvus infumatus (Sclater)

♀, Khao Soi Dao (3500 ft.), May 7.

The primary feathers are in moult.

Siamese birds agree with those from Sumatra, and one from Johore. Two females from Kyaukse, Chinn Hills, are very much paler and cannot

* According to Oberholser 192 mm. (Proc. U. S. Nat. Mus., 48, 1915, p. 596).

belong to *infumatus*, although that form, according to Peters and Baker extends northward to the Brahmaputra.

HEMIPROCNIIDAE

Hemiprocne longipennis coronata (Tickell)

6 ♂, 3 ♀, Srisawat (2500 ft.), July 4-7.

A male still retains part of the juvenile plumage. The soft parts of a female are noted as, "eyes dark brown; beak black; legs dark violet."

Hemiprocne longipennis longipennis (Rafinesque)

♂, ♀, Nong Tao, January 7; ♀, Waterfall, Trang, October 8; ♀, Khao Bhanam Bencha, August 27.

In these Proceedings for 1940 I reviewed the races of this species from the East Indian Islands and the Malay Peninsula and synonymized both *thoa* Oberholser and *harterti* Stresemann, thus reducing the recognizable forms from six to four. I retained *ocyptera* Oberholser, as the form inhabiting Nias, Sumatra, the Malay Peninsula and Borneo, on the basis of its having a darker abdomen and flanks than *longipennis*.

Ripley (Bull. Mus. Comp. zool., XCIV, 1944, p. 353), goes one step farther, and suppresses *ocyptera*, for, although finding that Malayan birds are the darkest below and Javanese specimens the lightest, birds from Borneo exhibit great variation as to the color of the lower parts, some being like Javanese and others like northern Malayan specimens, thus some assignable to *longipennis* and others to *ocyptera*. Under these circumstances he is quite right in suppressing *ocyptera*.

TROGONIDAE

Harpactes oreskios stellae Deignan

♂, 2 ♀, Wat Pa, October 13-20; 4 ♂, 2 ♀, Srisawat, July 2-14; ♀, Chanuman, January 22, 3 ♂, Kratt, November 21-December 10; 4 ♂, Khao Sabab, June 6-24; ♂, Khao Soi Dao (3500 ft.), May 3; 6 ♂, 4 ♀, Khao Luang (3400 ft.), August 21-September 14; ♂, Khao Nok Wua (2000 ft.), October; 5 ♂, Ban Thung Luang, January 11-23.

Harpactes oreskios uniformis (Robinson)

♂, Kapang, January 4; ♀, Khao Bhanam Bencha, September 17.

I am not convinced that *stellae* is really recognizable. If it is, the distinction between it and *uniformis* is not as clear cut as the describer believes. Deignan says (Auk, 58, 1941, p. 396) that the tail of *uniformis* measures 142-156 mm., and that of *stellae* 158-179 mm. Measurements of the tails of the birds in the Academy's collection are as follows. Only birds with perfect tails have been measured: Tavoy, Tenasserim, ♂, 175 mm.; Chiang Mai, ♂, 162, 162, 168, 178; Wat Pa, ♂, 164, ♀, 163; Srisawat, ♂, 155, 168, ♀, 168; Bua Yai, ♂, 174; Khao Sabab, ♂, 162, ♀, 155, 158; Kratt, ♂, 148;

Sriracha, ♂, 164, ♀, 169; Ban Thung Luang, ♂, 155, 158, 165, 170; Khao Luang, ♂, 148, 155, 163, 168, 168; Khao Nok Wua, ♂, 144; Kapang, ♂, 151; Khao Bhanam Bencha, ♂, 151; Meleowak, Atjeh, Sumatra, ♂, 174, ♀, 158 mm.

Birds from the north have, on the average, longer tails than more southern birds, but by splitting the species into a long and short tailed form, two populations are left isolated, one in Sumatra (referable to *stellae*) and another in southeastern Siam (referable to *uniformis*). For example, Chiang Mai birds vary from 162 to 178 mm., those from Khao Luang from 148 to 168 mm. A further example of the variability of tail in this species is that in *dulitensis* from Borneo, tails vary between 136 and 155 mm.

Harpactes erythrocephalus klossi (Robinson)

2 ♂, Kratt, November 27-December 12; 2 ♂, Khao Soi Dao (3000 ft.), May 6; 2 ♂, ♀, Khao Sabab, June 13-23.

The soft parts of a male are marked, "eyes chestnut; beak blue; legs gray." For a male of the northern form (*erythrocephalus*) I noted the "iris red; beak blue, culmen and point black; skin at base of beak and region about eye violet; feet and legs lilac."

Harpactes diardii sumatranus Blasius

♂, ♀, Khao Bhanam Bencha, August 11-14; ♂, Waterfall, Trang, October 10; ♂, Kapang, January 4.

Harpactes duvaucelii (Temminck)

3 ♂, 3 ♀, Khao Bhanam Bencha (3500 ft.), August 12-September 17.

ALCEDINIDAE

Ceryle rudis leucomelanura Reichenbach

♂, ♀, Wat Pa, October 3-10; ♂, Srisawat, July 15.

Alcedo atthis bengalensis Gmelin

2 ♂, ♀, Wat Pa, October 5-30; 2 ♂, Kemraj, January 1; ♂, Khao Nok Wua, October 22; 3 ♂, Khao Bhanam Bencha, September 17-18.

Alcedo meninting scintillans Baker

2 ♂, Khao Bhanam Bencha, September 7-16.

Alcedo euryzona peninsulae Laubmann

♂, Khao Luang, August 15.

The soft parts are recorded thus, "eyes dark brown; bill black; legs light orange."

Ceyx erithacus erithacus (Linnaeus)

2 ♂, 2 ♀, Khao Sabab (3000 ft.), June 12-23; ♀, Khao Luang (2000 ft.), August 16-September 20.

The Khao Luang birds are immature and have no trace of yellow on the lower parts.

***Pelargopsis capensis burmanica* Sharpe**

♂, Petriu, January 16; ♀, Khao Sabab, June 20.

***Pelargopsis capensis malaccensis* Sharpe**

♂, Khao Bhanam Bencha, September 11.

***Lacedo pulchella amabilis* (Hume)**

♂, Khao Soi Dao (3500 ft.), May 27.

***Lacedo pulchella deignani* new subspecies**

TYPE.—♂, ad., A.N.S.P., no. 113483, collected at Nakon Sritamarat, Peninsular Siam, May 25, 1933, by Y. Siah.

Description.—Resembles *L. p. amabilis* (Hume) in coloration but the wing and especially the tail are shorter. Resembles *L. p. pulchella* (Horsfield) in size but differs by more purplish blue crown, and absence of chestnut nuchal collar.

Measurements of type.—Wing 85, tail 67, culmen 32.5 mm.

Range.—Known only from southern peninsular Siam.

Measurements of additional specimens examined.—*L. p. deignani*, Khao Bhanam Bencha and Nakon Sritamarat, ♂, wing 80, 82, 83, tail, 65.5, 66.5, 69; Khao Bhanam Bencha, ♀, wing 85, tail 68 mm.

L. p. amabilis, BURMA: Mepli, ♂, wing 85, tail 72; Attaran, ♂, wing 89, tail 75; Thoungyin, ♀, wing 89, tail 81. SIAM: Cheing Mai, ♂, wing 92, tail 80; Khao Soi Dao, ♂, wing 87, tail 73; Chantaboon, ♂, wing 85, 86, 87, tail 74, 75, 76, ♀, wing 87, 92, tail, 77, 78. The tails of the type specimen of *amabilis* measure 76.20, and 83.82 (*fide* Deignan).

L. p. pulchella, SUMATRA: vicinity of Padang, Batu Sankar, Goenong Soegi, ♂, wing 85, 86, tail 64, 67. Malacca ♂, wing 81, 83, tail 61, 64 mm.

Remarks.—The single female from Khao Bhanam Bencha (*deignani*) differs from more northern birds (*amabilis*) by having the black bars of the crown at least twice as wide. From females of *pulchella* it differs by more rufescent upper surface and wider bars on the crown. Borneo birds (*melanops* (Bonaparte), a series of which I have examined, differ, of course, from all other forms by having black instead of chestnut sides to the head.

Deignan (Bull. U. S. Nat. Mus. 186, 1945, p. 205) says that *amabilis* (now including *deignani*) cannot be distinguished from *pulchella* by color characters. With this statement I do not agree for it appears to me that while *pulchella* has a broad chestnut nuchal band, *amabilis* and *deignani* do not. This is not a question of make, for by lifting the feathers of the hind neck of Siamese and Burmese specimens the feathers of this color would be apparent were they there. This chestnut band in specimens from the above mentioned countries, extends to the sides of the neck but does not cross at the back.

I have remeasured very carefully the Nakon Sritamarat specimens recorded in 1934 and find their tails are slightly shorter than I thought.

I have named this form in honor of Mr. Herbert G. Deignan, the foremost student of Siamese ornithology.

***Halcyon coromanda coromanda* (Latham)**

♀, Waterfall, Trang, October 1.

The soft parts are noted, "eyes light brown, beak and legs red."

From a female from the Ganges delta collected in 1931, this Malayan specimen differs by darker rufous upper parts, the violet gloss more purplish, less pinkish, the blue of the back much darker, and the throat tinged with buff instead of snow-white. In size there is no significant difference. The wing measures 111 mm., as against 113 mm., for the Ganges bird.

***Halcyon smyrnensis perpulchra* von Madarasz**

♀, Petriu, October 23; ♂, Khao Soi Dao (3500 ft.), May 10; ♂, Khao Sabab (3000 ft.), June 14; ♂, Kratt, December 2; 3 ♂, Khao Nok Wua, October 1-19; ♀, Khao Luang, August 30.

Males measure 115-121.5, the female 118 mm. A single female from Chenchwan, Szechwan, collected December 20, has the chocolate portions of the plumage paler than in Siamese birds, especially on the belly and flanks, and the wing measures 130 mm. Two females from the Ganges delta resemble Siamese birds in color and have wings of 122 mm. each.

From the appearance of the Szechwan bird the race *fokiensis* Laubmann and Götz appears recognizable, although Peters records it as doubtfully separable (Bds. Wld., V, p. 196).

For the use of the name *perpulchra* see Deignan (l. c., p. 203).

***Halcyon pileata* (Boddaert)**

♂, Kratt, November 30; ♂, Paknam, November 6; ♂, ♀, Khao Nok Wua (2000 ft.), October 2.

***Halcyon chloris armstrongi* Sharpe**

♂, Hua Mak, March 17.

***Halcyon concreta concreta* (Temminck)**

♂, 3 ♀, Khao Bhanam Benchu, (3500 ft.), August 28-September 19.

MEROPIDAE

***Merops leschenaulti leschenaulti* Vieillot**

♂, ♀, Kratt, November 27-December 11; ♀, Ban Thung Luang, January 14.

***Merops superciliosus philippinus* Linnaeus**

2 ♂, ♀, Khao Nok Wua (2000 ft.), October 4-11.

***Merops orientalis birmanus* Neumann**

2 ♂, 3 ♀, Wat Pa, October 5-9; 2 ♂, ♀, Khao Luang (3400 ft.), August 30-September 6.

Khao Nok Wua represents a very slight southward extension of the known range of this bird.

***Merops viridis viridis* Linnaeus**

2 ♂, Waterfall, Trang, October 10; ♀, Khao Nok Wua (2000 ft.), October 3. All in the green immature plumage.

***Nyctiornis amicta* (Temminck)**

♂, Waterfall, Trang, October 7; ♀, Nong Tao, January 15; ♀, Kapang, January 3; 4 ♂, 2 ♀, Khao Bhanam Bencha, August 2-September 19.

***Nyctiornis athertoni athertoni* (Jardine and Selby)**

♂, Chanuman, February 3; 3 ♂, Kao Sabab, June 11-23; ♂, Kratt, December 26; ♀ juv., Khao Soi Dao (3500 ft.), May 11; ♂, Srisawat, July 7; ♀, Pran, March 19; ♂, ♀, Ban Thung Luang, January 13-18; ♀, Khao Luang (3400 ft.), August 17; 4 ♂, 2 ♀, Khao Nok Wua (3400 ft.), September 26-October 14.

Birds taken in June and July are very worn, those taken in August, September and October are in very fresh plumage.

A juvenile taken in May with short bill, (30 mm.), wing (128 mm.), and tail (96 mm.), has the coloration precisely like that of the adult, with the blue "beard" fully developed and the forehead very blue.

It is most interesting that in the related species (*amicta*) young birds are first entirely green, the red "beard" being acquired gradually, and the colors of the forehead and crown at an even later date.

CORACIIDAE***Coracias bengalensis affinis* McClelland**

♀, Srisawat, June 30; ♂, Khao Soi Dao, May 8; ♂, Paknam, March 22; ♀, Khao Luang, August 30.

The bird from Srisawat is in very worn plumage.

***Eurystomus orientalis orientalis* (Linnaeus)**

♂, Ban Thung Luang, January 21; ♀, Pran, March 18; 2 ♀, Khao Nok Wua (2000 ft.), October 5; ♂, 2 ♀, Khao Bhanam Bencha, August 31-September 14; ♀, Nong Tao, January 6; Khao Soi Dao (3500 ft.), May 7.

The bird taken at Khao Soi Dao has a wing tip of 34, tail-wing ratio of 52, bill height 17 mm.

***Eurystomus orientalis deignani* Ripley**

♂, ♀, Khao Nok Wua, September 31-October 2; ♀, Khao Luang, August 17.

These birds seem to fall within the measurements given by Ripley for this form. I am not convinced as to its validity as there appears to be considerable overlap in all measurements between *deignani* and *orientalis*.

UPUPIDAE

Upupa epops longirostris Jerdon

♂, ♀, Srisawat, June 29-July 6; ♂, ♀, Chanuman, January 24; ♂, ♀, Khulu, December 21-23; Khao Luang, August 11-September 6.

Srisawat birds are worn. The two from Khao Luang, are completing the moult with the new primaries coming in.

BUCEROTIDAE

Berenicornis comatus (Raffles)

♂, ♂ juv., ♀, Khao Bhanam Bencha (3500 ft.), August 22-29.

The soft parts of the female are noted as, "eyes orange; beak gray; legs black"; those of the immature male, "eyes white with blue (? tinge); beak ivory; legs gray."

Anorrhinus galeritus carinatus (Blyth)

♂, Waterfall, Trang, October 1; ♀, Khao Bhanam Bencha, August 8.

Aceros plicatus subruficollis (Blyth)

♂, ♀, Ban Thung Luang, January 22-24; ♀, Keng Sok, March 7.

Anthracoceros malayanus (Raffles)

♂, ♀, Khao Bhanam Bencha, September 20-21.

The male, with well-developed casque, has a barely indicated gray superciliary stripe, the female a broad white one, with a gray moustachial streak. In a pair from Sumatra the reverse is true. A male, with enormous casque, projecting, detached, from the point where it leaves the mandible by 70 mm., has broad white eyebrows, while an immature female, has the eyebrows and moustachial streak gray.

Anthracoceros malabaricus leucogaster (Blyth)

2 ♀, Kratt, November 27, 29; ♂, Wat Pa, October 26; 2 ♂, Srisawat, June 30-July 2; ♀, Ban Thung Luang, January 12; ♂, Khao Nok Wua, September 25; ♂, ♀, Khao Luang, August 12-21; ♂, Kapang, December 29.

Buceros bicornis bicornis Linnaeus

♂ imm., ♀, Khao Luang, August 24-September 7.

The female is much smaller than northern birds (*cavatus* (Shaw)). Its wing measures 450 mm. Delacour gives the minimum for Indo-China birds as 500 mm.

Rhinoplax vigil (Forster)

♂, ♀ imm., Khao Bhanam Bencha (3000 ft.), August 29-September 5.

The adult male has both the lengthened tail feathers, as does another bird from Sumatra.

CAPITONIDAE

Calorhamphus fuliginosus hayi (Gray)

♀, Khao Bhanam Bencha, August 11.

Chotorhea chrysopogon laeta Robinson and Kloss

♀, Khao Luang, August 5.

Chotorhea mystacophanes mystacophanes (Temminck)

4 ♂, Khao Bhanam Bencha (3500 ft.), August 11-18; ♂, Waterfall, Trang, October 2.

Cyanops armillaris henricii (Temminck)

♂, Khao Bhanam Bencha, August 4.

Cyanops incognita euroa Deignan

Journ. Wash. Acad. Sci., 29, 1939, p. 177.

♂, 6 ♀, Khao Soi Dao (3000 ft.), May 2-31; ♂, 4 ♀, Khao Sabab (3000 ft.), June 2-22.

Cyanops australis stuarti (Robinson and Kloss)

♀, Waterfall, Trang, October 3.

Cyanops australis orientalis (Robinson)

2 ♂, 2 ♀, Rayong, October 15; ♂, 2 ♀, Kratt, November 27-December 27.

This form is recognizable from northern Siamese birds by slightly larger bill, less blue on the ear coverts, more red at the base of the blue throat, which is very slightly paler blue, and on the average more yellowish, less red, sub-ocular mark. Bills of ten males of *orientalis* measure: 17, 17.5, 17.5, 18 (4), 18.5 (3), 19, 19.5, 20, females, 19 (3), 19.5, 20, 21, 22 mm. Bills of *invisa* Deignan (Auk, 58, 1941, p. 398), measure ♂, 17 (4), 18, 19.5. ♀, 16, 16 mm.

From *stuarti* it differs by longer wing, longer bill, the red sub-ocular spot more mixed with yellow. *Orientalis* appears to range through central and eastern Siam, leaving the peninsula to *stuarti* and the northern plateau to *invisa*. Delacour does not record this form from Indo-China but it doubtlessly occurs in the southwestern portion of the country.

In addition to the specimens listed above we have specimens of *orientalis* from Bua Yai, Kon Ken, and Chantaboon.

Cyanops zeylanica hodgsoni Bonaparte

2 ♂, 2 ♀, Srisawat, July 4-29; 3 ♂, 6 ♀, Wat Pa, October 10-November 5; 2 ♂, Chanuman, January 7-10; ♀, Khulu, December 27; ♂, Khao Sabab (3000 ft.), June 22; ♀, Keng Sok, March 4; ♂, ♀, Ban Thung Luang, January 10-16; ♂, Khao Luang (3400 ft.), September 7; ♂, Khao Nok Wua (2000 ft.), October 3.

Undeniably southern birds average smaller than northern ones, but there is so much overlap that no use is served by recognizing *intermedia* Baker. Riley measured eight specimens from peninsular Siam and Trang and found the wings to vary between 121-128.5 mm. Our specimens from southwest and peninsular Siam measure, Keng Sok, 127, Ban Thung Luang ♂, 124, ♀ 130, Khao Nok Wua, ♂ 127, ♀ 131, Khao Luang ♂ 122 mm. Baker gives the measurements for *hodgsoni* as 123-137 mm., and for *intermedia* 115-129 mm.

Cyanops faiostricta faiostricta (Temminck)

2 ♂, ♀, Khao Sabab (3000 ft.), June 23; 3 ♂, 4 ♀, Kratt, December 4-26; 2 ♂, 3 ♀, Khao Soi Dao (3500 ft.), May 14-31; ♂, 3 ♀, Wat Pa, October 17-November 4; 3 ♂, ♀, Khao Luang (3400 ft.), August 5-22; ♀, Khao Nok Wua (2000 ft.), September 30.

I do not believe this species has been previously recorded so far south in southwestern Siam.

Xantholaema haemacephala indica (Latham)

♂, ♀, Chanuman, January 8-18; ♂, Khulu, December 20; ♂, ♀, Khao Soi Dao (3500 ft.), May 7; ♂, Wat Pa, October 20; 4 ♂, ♀, Khao Luang (3400 ft.), August 12-September 11; ♂, ♀, Khao Bhanam Bench, September 12.

An adult male taken at Hua Mak, March 17, is in very worn plumage, with the yellow of the underparts faded to white.

A juvenile female was taken at Hua Mak on the same date. Above it is gray-green, throat and lower parts whitish, the latter streaked with gray-green. The yellow marks above and below the eye are present. A slightly older bird taken at Khao Soi Dao, May 7, differs by having the fore-crown gray-green, followed by an indication of black, and the upper surface brighter green. Another still slightly older specimen (male) taken at Srisawat June 29, differs from the last by having the fore-crown lemon yellow, the throat and lower surface more strongly tinged yellow. Another male, Khao Soi Dao, May 7, somewhat older, has the fore-crown gray with a few red feathers appearing on the forehead and sides and the red patch coming in on the chest. The throat is yellow.

PICIDAE

Picus erythropygius nigrigenis (Hume)

2 ♂, 3 ♀, Srisawat, June 29-July 11; ♂, Wat Pa, October 30.

A juvenile was taken on June 29.

Picus erythropygius erythropygius (Elliot)

♂, Kemraj, December 29; 2 ♂, 2 ♀, Chanuman, January 28-February 8; ♂, 2 ♀, Khulu, December 22-26.

Easily recognizable by the white instead of black bill.

Picus viridanus weberi (Müller)

♂, Ban Thung Luang, January 13; 2 ♂, ♀, Khao Luang (3400 ft.), August 6-August 28; ♂, Nong Tao, January 7; ♂, Khao Bhanam Benchha, August 15.

Riley does not recognize this race but he had little comparative material (p. 212) when he rejected it. I am in the same position but feel it had better be recognized until suitable comparative material can be examined. Kloss (Ibis, 1926, p. 689) had fifty specimens when he described *meridanus* (= *weberi*) from Trang, therefore I defer to his opinion that the southern birds are separable on size.

Our specimens have wings measuring as follows: Ban Thung Luang, ♂, 134; Khao Luang, ♂, 133, 137, ♀, 137; Nong Tao, ♂, 139; Khao Bhanam Benchha, ♂, 128 mm. Kloss's measurements for 50 specimens from Junk Seylon, and Patani south to Perlis, were 129-138 mm.

Picus vittatus eisenhoferi Gyldenstolpe

3 ♂, Kratt, November 28-December 4; ♀, Khao Sabab, June 10; 2 ♂, ♀, Khao Soi Dao, May 22; 2 ♂, Chanuman, February 6-10; ♂, Kemraj, December 30; ♂, Rayong, October 22; 2 ♂, ♀, Wat Pa, October 22-November 3; ♂, 2 ♀, Srisawat, June 30-July 2; 2 ♂, ♀, Khao Luang, July 9-August 30; ♂, Khao Nok Wua, October 2.

Picus canus hessei Gyldenstolpe

♀, Chanuman, February 2; 2 ♀, Wat Pa, October 12-13; 2 ♂, 4 ♀, Ban Thung Luang, January 10-22; 4 ♂, Khao Nok Wua (2000 ft.), September 16-October 17; 3 ♂, 3 ♀, Khao Luang (3400 ft.), August 2-September 11.

Mt. Victoria birds have smaller bills than Siamese examples, as does our specimen from Meng Pek, Southern Shan States. Bills of birds from Mt. Victoria measure ♂, 35, 35.5, 36, ♀, 35, Southern Shan States ♀, 32. Siamese males have bills that measure as follows: 35.5, 36, 37, 38, 39 (3), 41 (3), ♀, 36, 36, 37, 37, 38, 38, 39, 39, 40, 42 mm.

Perhaps these small-billed birds should be referred to *gyldenstolpei* but Greenway in his review of eastern forms of this species, doubts that that form is valid, and his findings are based on large amounts of material.

Picus puniceus observandus Hartert

2 ♂, ♀, Khao Bhanam Benchha (3500 ft.), September 1-15; ♀, Kapang, December 29.

The wings of these birds measure: ♂, 121, 127, ♀, 130, 130.5, two males from Nakon Sritamarat measure 123, 130 (worn). A recently collected male from Koetatjani, Sumatra, has a worn wing tip, but measures, in spite of this, 130 mm.

With this added material, I still do not feel that *continentis* is recognizable.

***Picus chlorolophus burmae* Meinertzhagen**

♂, 2 ♀, Srisawat, June 30-July 5; ♀, Keng Sok, March 12; 2 ♂, 2 ♀, Ban Thung Luang, January 10; ♂, 3 ♀, Khao Nok Wua (2000 ft.), September 20-October 15; 2 ♂, Khao Luang (3400 ft.), September 11, 14.

This form has been recorded previously south as far as Amherst in Tenasserim and Kanburi in Siam.

***Picus chlorolophus laotinus* Delacour**

3 ♂, Wat Pa, October 20-November 5; ♂, ♀, Chanuman, February 2.

Having no material from Koon Tan, I sent my series of this and *burmae* to Mr. Deignan who was kind enough to identify them for me.

***Chrysophlegma flavinucha lylei* (Kloss)**

♂, ♀, Srisawat, July 3, 11; ♂, 2 ♀, Keng Sok, March 4-7; ♀, Ban Thung Luang, January 17; 3 ♂, 2 ♀, Khao Luang, August 7-September 16; ♂, 5 ♀, Khao Nok Wua, September 12-October 17.

Birds from Khao Luang are virtual topotypes of *lylei*. Northern birds are larger and females have deeper rufous throats and less rufescent crowns. I should call these *flavinucha* for they agree in size with the northern form.

Wing measurements of birds in the Academy's collection are as follows: INDIA: ♂, 171, 171, 175, ♀, 166; Chinn Hills, ♂, 165, 171, ♀ 164.5, 167. SOUTHERN SHAN STATES: Keng Tung, ♀, 174.5. SIAM: Pha Hom Pok, ♂, 174, 178, ♀, 165, 173; Chieng Dao, ♀, 165, 169; Chieng Mai, ♂, 162, 163, 167, ♀, 165, 166; Srisawat, ♂, 156, ♀, 146; Ban Thung Luang, ♀, 163; Keng Sok, ♂, 154, ♀, 158.5, 159; Khao Luang, ♂, 155, 157, 162.5, ♀, 155, 158, 158, 160 (worn), 160 (worn).

Chieng Mai birds are intermediate in size, but Pha Hom Pok birds are clearly referable to *flavinucha*, although the throat is slightly paler yellow.

***Chrysophlegma flavinucha annamensis* Delacour**

♂, ♀, Wat Pa, October 27; ♂, Pong Udon, February 17; ♀, Bua Yai, January 11; 4 ♂, Chanuman, January 11-29; ♂, Khulu, January 2.

In addition to the dark bill, easily separable from *flavinucha* and *lylei* by having the throat in both sexes spotted almost to the chin, and in males the pale yellow of the neck confined to the sides only and cream—instead of sulphur-yellow.

If these birds are placed in the genus *Picus* the subspecific name becomes *archon* Deignan, for *annamensis* is already in use as a subspecific name for a form of *Picus chlorolophus*.

***Chrysophlegma flavinucha pierrei* Oustalet**

♀ imm., Khao Soi Dao, May 6.

***Gecinulus viridis viridis* Blyth**

4 ♂, 4 ♀, Wat Pa, October 9-November 6; ♂, ♀, Khao Soi Dao, May 21.

The wings of these birds measure, ♂, 127-136, ♀, 129-132. A female from Dudaw Taung, Chinn Hills, has a wing of 137 mm.

Deignan says that in the lowlands of Cheing Rai *G. grantia indochinensis* may "just possibly" occur (Bull. U. S. Nat. Mus., 186, 1945, p. 239). In this connection it is interesting to note that of *grantia* Baker says, "It has also been recorded from Laos in Siam, a specimen from this place being in the Paris Museum." (Fauna Brit. India., IV, p. 28.)

***Gecinulus viridis robinsoni* Kloss**

4 ♂, 2 ♀, Khao Bhanam Bencha, September 2-16; ♀, Nong Tao, January 10.

These birds are darker and smaller than northern examples. The wings measure ♂, 117-124, ♀, 115-122. I have not been able to compare them with undoubted examples of *robinsoni*.

***Callolophus miniatus perlutus* Kloss**

♂, Pran, March 19; 4 ♂, 5 ♀, Ban Thung Luang, January 5-21; ♂, Khao Luang (3400 ft.), August 15.

The wing of the Khao Luang male measures 136 mm. Four males, virtual topotypes from Ban Thung Luang, have wings of 136-140. The Pran male measures 136 mm.

***Callolophus miniatus malaccensis* (Latham)**

♂, Waterfall, Trang October 9.

The wing measures 131 mm. which appears to be about the maximum for this form.

***Chloropicoides rafflesii peninsularis* (Hesse)**

♂, ♀, Khao Banham Bencha, August 8, 22.

***Blythipicus rubiginosus rubiginosus* (Swainson)**

♂, ♀, Waterfall, Trang, October 1-9; 3 ♂, Khao Bhanam Bencha (3500 ft.), August 14-September 20.

***Dryobates hyperythrus annamensis* Kloss**

♀, Khulu, December 24.

Slightly paler below than four Chinn Hill examples (*heinrichi* Stres.) and with spots on the crown smaller and rounder. Kloss' description is misleading when he says, "paler below than any of the known forms" if my specimen properly represents *annamensis*, for it is certainly a great deal darker on the under surface than *subrufinus* of eastern China as exemplified by a specimen from Weihsien, Shantung.

This form, known from but few specimens, has not been recorded from Siam before. I have, however, not compared it with Annamese birds but Kloss says that the characters of the race first appear in Southern Shan States birds so this bird should be, at least fairly close to the bird in question. The soft parts are marked as follows: "Upper beak, dark gray; lower beak yellowish green; eyes red; legs dark gray."

***Dryobates canicapillus delacouri* de Schauensee**

♂ (type), 3 ♀, Chanuman, January 7-12; 2 ♂, 3 ♀, Khulu, December 19-25; 2 ♂, ♀, Khao Sabab, June 14-20.

***Dryobates canicapillus canicapillus* (Blyth)**

♂, Wat Pa, October 22; ♂, ♀, Srisawat, July 1-8.

The wings of these birds measure in the order given above 83, 81.5, 82, 83. The first is in very fresh plumage, the other three rather worn. The Wat Pa bird is deep black above thus agreeing with northern, rather than with the browner eastern Siamese examples. Southern birds average smaller than north Siam examples, and the name *pumilus* (Hargitt) is available for them, but the overlap in measurements seems too great to warrant its use (see Proc. A.N.S.P., 90, p. 109, 1938 for measurements of additional specimens).

***Dryobates macei longipennis* (Hesse)**

♂, ♀, Wat Pa, October 5-6; ♂, Khao Luang, September 7.

Khao Luang is the southernmost recorded locality for this form.

***Meiglyptes tukki tukki* (Lesson)**

♂, ♀, Khao Bhanam Bencha (3500 ft.), August 12-17; ♂, Waterfall, Trang, October 6.

Wings of the specimens measure, ♂, 96, 105, ♀, 97. We do not have sufficient Sumatran material to judge whether the peninsular birds should be called *brunneus* (Eyton).

***Meiglyptes jugularis* Blyth**

♂, 2 ♀, Kratt, December 1-3; ♂, ♀, Khao Sabab (3000 ft.), June 10, 13; 3 ♂, ♀, Khao Soi Dao, May 2, 31.

Apparently most common in Siam in the southeastern portion of the country and very rare in the north. The soft parts of a female are marked, "eyes dark brown; beak black; legs gray-green."

***Meiglyptes tristis grammithorax* (Malherbe)**

2 ♂, ♀, Kapang, January 2-4; 5 ♂, 7 ♀, Khao Bhanam Bencha (3000 ft.), August 4-September 6; ♂, 2 ♀, Khao Luang, August 6-September 20.

***Micropternus brachyurus annamensis* Delacour & Jabouille**

♂, ♀, Kemraj, January 5; 2 ♂, 2 ♀, Chanuman, January 29-31; 2 ♂, ♀, Khulu, December 3-24; 3 ♂, Khao Soi Dao, May 5-17; ♂, Khao Sabab, June 11; ♂, Kratt, December 2.

These birds are more heavily banded with black below than a series from northern Siam. The throats average more heavily streaked and the streaking is usually darker. The wings measure ♂, 125-130, ♀, 124-129 mm. Chiang Mai birds measure ♂, 123-126, ♀, 127-132 mm. This is a notoriously variable bird in color and nothing can be done with single specimens. Siamese birds are in need of revision.

Not previously recorded from Siam.

***Micropternus brachyurus phaiiceps* Blyth**

♂, Khao Nok Wua, October 11; 2 ♂, 3 ♀, Khao Luang, August 9-September 9.

Smaller and less heavily banded below, and somewhat darker in color than eastern Siamese birds.

Wings of males measure 118-122 mm., those of females 116-118 mm.

Deignan writes me (December 6, 1945), that *williamsoni* is a synonym of *phaiiceps*. He probably will write on this subject.

Specimens from Nakon Sritamarat are still smaller. The wings of a male measure 114, and 2 ♀, 114-115 mm.

***Dinopium javanense javanense* (Ljungh)**

♂, Waterfall, Trang, October 9; ♂, Khao Bhanam Bencha, September 9.

The wings of these two measure 130-131 mm.

***Dinopium javanense intermedium* (Blyth)**

4 ♂, Khao Luang, September 11-13; ♀, Kratt, December 1; ♂, ♀, Khao Soi Dao (3500 ft.), May 7; ♂, ♀, Chanuman, January 7-12; 2 ♀, Wat Pa, October 3-14; 2 ♂, ♀, Srisawat, July 1-29.

The two from Khao Luang are closest in size to this form; their wings measure 137-147 mm.

***Dryocopus javensis javensis* (Horsfield)**

♂, Khao Bhanam Bencha. September 16.

This bird agrees with Borneo and Sumatran examples in having the white on the primaries confined to the base, and in having a black instead of white rump.

***Dryocopus javensis feddeni* (Blyth)**

♂, ♀, Khao Luang (3400 ft.), August 13; 3 ♂, ♀, Chanuman, January 6-19; ♀, Wat Pa, October 15.

The pair from Khao Luang might just as well be called *javensis*; the male has a white rump, and extensive white markings on the primaries. The female has a black rump and the white confined to the base of the primaries. The two forms apparently meet in this latitude (11° 40').

Birds from Chanuman, Wat Pa and the male from Khao Luang all have smaller white tips to the primaries than two from Chiang Mai and one from the Chinn Hills, otherwise they agree.

***Mulleripicus pulverulentus harterti* Hesse**

♀, Nong Tao, January 13; ♂, 2 ♀, Khao Bhanam Bencha (3500 ft.), August 13-September 18; 3 ♂, 2 ♀, Khao Luang (3400 ft.), August 13-September 16; ♀, Khao Nok Wua (2000 ft.), September 21; ♂, ♀, Ban Thung Luang, January 12-26; ♂, ♀, Keng Sok, March 6; 2 ♂, Khao Soi Dao (3500 ft.), May 18-26; ♂, Kratt, December 9; ♂, Khulu, December 25; ♂, Chanuman, February 8.

Birds from Trang are intermediate between this race and the typical form.

***Hemicercus canente canente* (Lesson)**

♂, 3 ♀, Khao Luang (3400 ft.), August 5-September 15; ♂, Ban Thung Luang, January 20; ♂, Kratt, November 29; 2 ♀, Khao Sabab (3000 ft.), May 11-21; ♂, Rayong, October 21; ♂, Kemraj, January 4; ♂, ♀, Wat Pa, October 15-28.

A female from Khao Soi Dao has the under parts black instead of oily greenish. This bird has the soft parts marked as follows: "Eyes dark brown; beak and legs black." Another female (Khao Luang) is marked as having had the "eyes light brown; beak black; legs dark bluish gray."

***Hemicercus concretus sordidus* (Eyton)**

2 ♂, ♀, Khao Bhanam Bencha (2000-3000 ft.), August 8-13.

Compared with Sumatra birds, the lower parts have a more greenish tinge, and in the males, the crest is darker red. The Malayan female has the crown dull ochraceous not orange-ochraceous as in a Sumatran female.

***Sasia abnormis abnormis* (Temminck)**

♂, 2 ♀, Khao Bhanam Bencha (3000 ft.), August 13-17; ♂, Waterfall, Trang, October 11.

***Sasia ochracea querulivox* Baker**

♀, Chanuman, February 12; 2 ♂, Wat Pa, October 27-30.

These appear to have had red orbits. They are slightly smaller than northern birds. Their wings measure ♂, 50-51, ♀, 53 mm. as against north Siam birds, 2 ♂, 54, 55, 2 ♀, 53, 56, one no sex 53 mm. A female from the Chinn Hills has a wing of 55 mm.

***Sasia ochracea reichenowi* Hesse**

♂, ♀, Keng Sok, March 10.

These two appear to have had the orbits black. They measure 57, 53 mm. The bills are slender not more robust as they should be in this form, according to Deignan (Bull. U. S. Nat. Mus., 186, 1945, p. 254).

The forms of this species appear to need more investigation.

***Lynx torquilla chinensis* Hesse**

o, Wat Pa, October 8.

The wing measures 86 mm. That of a female from Chieng Rai 84 mm. A male from Peking measures 83, four males from Weihsien, Shantung, 82-86, two females 84, 85 mm. Tibetan birds are somewhat larger; they measure ♂, Tungolo, 85, ♀, Jaykundo 92, 87.5, no sex, Dawo, 87 mm.

We have no Japanese material, but birds from there appear to be smaller.

EURYLAIMIDAE

Calcyptomena viridis continentis Robinson and Kloss

6 ♂, 7 ♀, Khao Bhanam Bencha (3500 ft.), August 8-27.

Psarisomus dalhousiae dalhousiae (Jameson)

4 ♂, 2 ♀, Chanuman, February 4-7.

Psarisomus dalhousiae cyanicauda Riley

♂, ♀, Khao Soi Dao (3500 ft.), May 2.

Separable from the typical race by slightly darker back, and deeper blue, less greenish blue, tail.

Serilophus lunatus subspecies

♂, Wat Pa, October 31; ♀, Khao Soi Dao, May 1; ♂, Kratt, December 4.

Birds from north Siam seem intermediate between *lunatus* and *elizabethae*. A male from the Southern Shan States is very bright and agrees with a ♂ from Thoungyin. A Bolovens ♂ is very dark with no rufescent on the cheeks, grayer pileum and mantle, and is apparently referable to *elizabethae*. Among all our Siamese birds a male from Kratt is closest to it, but it has the pileum and cheeks more buffy.

Serilophus lunatus stolidus Robinson and Kloss

♀, Khao Luang, August 8.

A dull bird, if not typical, then approaching *stolidus*. We have no southern Malay Peninsula material for comparison.

Eurylaimus javanicus pallidus Chasen

3 ♂, 2 ♀, Wat Pa, October 21-27; 7 ♂, 2 ♀, Khao Soi Dao, (3500 ft.), May 1-27; 2 ♂, Kao Sabab (3000 ft.), June 13; ♂, ♀, o, Kratt, November 26-December 9; ♂, ♀, Khao Luang, (3400 ft.), September 15-25; 2 ♂, 2 ♀, Khao Bhanam Bencha (3500 ft.), August 20-September 9.

Eurylaimus ochromalus ochromalus Raffles

4 ♂, 4 ♀, Khao Bhanam Bencha (2000-3000 ft.), August 2-September 9.

Corydon sumatranus laeensis de Schauensee

♂, ♀, Wat Pa, October 19; 2 ♂, 3 ♀, Khao Soi Dao (3500 ft.), May 5-13; ♂, ♀, Khao Sabab (3000 ft.), June 10; ♂, Kratt, December 1; 2 ♂, ♀, Keng Sok, March 3-9; 3 ♂, 2 ♀, Ban Thung Luang, January 14; 6 ♂, ♀,

Khao Luang (3400 ft.), August 8-September 30; 3 ♂, 5 ♀, Khao Bhanam Bencha (2000-3500 ft.), August 4-11; ♀, Waterfall, Trang, October 10.

Birds from Trang are not quite as deep black as birds from farther north. Immatures with dusky to whitish throats were taken August 9, 15, and September 20.

Cymbirhynchus macrorhynchus siamensis de Schauensee and Ripley

4 ♂, 3 ♀, Kratt, November 30-December 2; ♂, ♀, Khao Sabab (3000 ft.), June 10, 17; 4 ♂, ♀, Khao Soi Dao (3500 ft.), May 8-22; 2 ♂, ♀, Srisawat, July 7; ♂, ♀ (type) Pran, March 17-18; ♀, Keng Sok, March 9; ♀, Ban Thung Luang, January 11; 4 ♂, 3 ♀, Khao Bhanam Bencha (2000 ft.), August 2-September 16; ♀, Nong Tao, January 5.

PITTIDAE

Anthocincla phayrii obscura Delacour

2 ♂, 2 ♀, Khao Soi Dao (3500 ft.), May 24-27; ♂, ♀, Khao Sabab (3000 ft.), June 14.

Slightly darker than a bird from Khun Tan. The soft parts of a male are marked, "eyes dark brown; beak black; legs gray."

Pitta nipalensis subspecies

♀, Khao Soi Dao (3500 ft.), May 21.

Pitta n. nipalensis is recorded south to northern Arrakan by Baker, and of course this bird is from very much farther south.

It is too big for *hendeei* of Indo-China for which Bangs and Van Tyne give the wings for 13 ♂ as 109-114 and 11 ♀, as 107-113 mm. My specimen has a wing of 122 mm. In size, therefore, it is like *nipalensis* (wing 116-129 *vide* Baker). The soft parts are marked, "eyes light brown; beak light gray; legs flesh color."

In these Proceedings (86, 1934, p. 244) I recorded a juvenile bird from Mong Lin, Southern Shan States, with spotted crown as *oatesi*. On re-examination I believe it to be an immature female of *nipalensis* (perhaps *hendeei*), for it shows two greenish blue feathers on the nape.

Pitta caerulea caerulea (Raffles)

♂, Khao Bhanam Bencha (3000 ft.), August 20.

From a very old Sumatra specimen this bird differs by having a paler blue back, much less purplish blue. The soft parts are marked, "eyes light brown; beak black; legs whitish gray."

Pitta caerulea aurantiaca Delacour

4 ♂, Khao Soi Dao (3000 ft.), May 1-31.

The soft parts are marked, "eyes light brown; beak very dark gray; legs flesh color."

Pitta cyanea peninsularis new subspecies

TYPE.—♂ ad., A.N.S.P. no, 130326, collected at Khao Luang (3400 ft.), Peninsular Siam, August 8, 1937, by Lucas Bah.

Description.—Differs from *P. c. cyanea* Blyth by having the back, including the tail, deeper blue, the breast strongly washed with ochraceous, the crest brighter scarlet. The belly is (in both sexes) much less regularly and heavily spotted with black.

From *aurantiaca* it differs by having the back not quite as dark and less purplish blue in tone, the crest more scarlet, less orange-scarlet, the breast more strongly washed with ochraceous. Spotting on the under surface much less heavy.

Measurements of type.—Wing 113.5, tail 58, culmen 22, tarsus 45 mm.

Range.—Known only from the type locality.

Material examined.—*P. c. cyanea* ♂, Thoungyin Valley, Burma; ♀, Mephi, Burma; ♂, Doi Suthep (5500 ft.).

P. c. aurantiaca, 4 ♂, Khao Soi Dao (3500 ft.); ♂, ♀, Chantaboon.

P. c. peninsularis, ♂, ♀, ♀, imm., Khao Luang (3400 ft.).

P. c. willoughbyi, 3 ♂, 5 ♀, Bolovens Plateau, Laos.

Remarks.—This species has not been previously recorded from so far south.

The female has the same reduction of the spotting on the under surface as the male.

The soft parts for the type are marked, "eyes light brown; beak black; legs very light gray."

Pitta brachyura moluccensis (Müller)

4 ♂, Srisawat, July 2-12; 2 ♂, 5 ♀, Khao Soi Dao (3500 ft.), May 8-31; 3 ♂, 2 ♀, Khao Sabab (3000 ft.), June 11-21; 2 ♀, Khao Nok Wua (2000 ft.), September 25-October 1; ♂, ♀, Khao Bhanam Bencha, August 5-September 8.

Ten western birds appear a trifle paler below than 18 birds from eastern Siam. The difference, although not very great, can be seen in series.

Pitta sordida cucullata (Müller)

2 ♂, 3 ♀, Khao Soi Dao (3000 ft.), May 22-31; ♀, Khao Sabab (3000 ft.), June 21; ♂, 2 ♀ (juvenile), Khao Bhanam Bencha (3000 ft.), August 8-22.

Females resemble males, but have the underparts a trifle duller, and no white on the outer web of the first primary, and only occasionally, a little spot on the outer web of the second.

Juvenile females are more or less like adults above, but differ from them by having large white spots on the wing coverts, the lower throat dirty white, the chest brown, the center of the abdomen salmon-pink.

Pitta irena ripleyi Deignan

Proc. Biol. Soc. Wash., 59, p. 55, 1946 (Khao Soi Dao, Trang).

9 ♂, 3 ♀, Khao Bhanam Bencha (2000-3500 ft.), August 7-September 16; ♂, Waterfall, Trang, October 7.

Pitta gurneyi Hume

♂ nestling; 2 ♀, ♀ imm., Khao Bhanam Bencha (2000-3500 ft.), August 5-27.

The nestling male has the crown spotted fulvous white, the back sepia, region behind and below the eye blackish brown, throat dirty white, lower parts fulvous, obsoletely spotted with dirty white. An older bird (female) has the feathers of the crown buffy, edged with black, the back as in the adult, and the lower surface partly like adult females, partly like the immature bird.

ALAUDIDAE*Alauda arvensis herberti* Hartert

♀, Rayong, October 23.

HIRUNDINIDAE*Hirundo rustica gutturalis* Scopoli

2 ♂, ♀, Wat Pa, October 4; ♂, Ban Thung Luang, January 21.

Hirundo smithii filifera Stephens

2 ♂, 3 ♀, Chanuman, January 28-February 10.

PERICROCOTIDAE*Pericrocotus flammeus elegans* McClelland

5 ♂, 4 ♀, Wat Pa, October 13-November 1; 5 ♂, 3 ♀, Srisawat, June 30-July 10; 4 ♂, 2 ♀, Khulu, December 18-24; 6 ♂, 3 ♀, Chanuman, January 2-30; 3 ♂, ♀, Khao Sabab, June 7-18; 3 ♂, Khao Soi Dao, May 11-14.

Birds from the above localities average smaller than birds from Chiang Mai, Chiang Dao, Chiang Sen and other northern localities. This difference shows particularly in the length of the tail. In color there is virtually no difference. Perhaps the southern birds average a trifle deeper scarlet. Wing and tail measurements of birds from the various localities are as follows: Dudaw-Taung, Chinn Hills, 2 ♂, wing 96, 97, tail 85, 88, ♀, wing 94, tail 88; Chiang Mai-Chiang Dao, 6 ♂, wing 95-99, tail 83-92, 8 ♀, wing 90-97, tail 82 (once), 85-93; Khun Tan, 2 ♂, wing 97, 97, tail 84, 88, ♀, wing 97, tail 88; Chiang Sen, 2 ♂, wing 95, 95, tail 84; Wat Pa, 5 ♂, wing 93-97, tail 77-82, 4 ♀, wing 92-96, tail 81-87; Me Poon 2 ♂, wing 91, 92, tail 75, 76, 2 ♀, wing 91, 96, tail 80, 81; Srisawat 5 ♂, wing 91-93, tail 80-83, 3 ♀, wing 92-95, tail 80-87; Bua Yai, ♀ wing, 94, tail 81; Chanuman-Khulu 5 ♂, wing 95-98, tail 79-84, 5 ♀, wing 91-95, tail 78-85; Khao Soi

Dao-Khao Sabab, 5 ♂, wing 94-98, tail 77-83; Chantaboon, 2 ♂, wing 92, 94, tail 76, 77; Sriracha, ♀, wing 90, tail 75.

Northern birds have wings of ♂ 95-99, tails 83-92, ♀ 90-97, 82-93. The more southern ones, ♂, wing 91-98, tail 75-84, ♀ wing 91-96, tail 75-87. Siamese birds north of the Peninsula should all be treated as one form as there is considerable overlap in tail measurements.

Birds from Keng Tung, Southern Shan States, belong to a different form, distinguished by having the two central rectrices black, the apical half of the outer web usually narrowly edged with red, instead of the outer web wholly red as in *elegans*. Those are perhaps referable to *bakeri* La Touche. Females are distinguished by having the forehead not nearly as bright a yellow. They also average a trifle larger.

Three specimens, 2 ♂, and a ♀, all from Doi Souteb taken in December, two of them on the same day, belong to this form, and are probably migrants or wanderers. They measure as follows: ♂, wing, 100, 101, tail 93, 94, ♀, wing, 101, tail, 102 mm. Strangely, my collectors did not secure this very common and conspicuous bird on Doi Pha Hom Pok where it undoubtedly occurs. Quite possibly that mountain is inhabited by *bakeri* rather than *elegans*.

The discovery of this form on Doi Souteb adds another bird to the immense fauna of that remarkable mountain.

Pericrocotus flammeus flammifer Hume

3 ♂, ♂ imm., ♀, Ban Thung Luang, January 10-15; 2 ♂, ♀, Keng Sok, March 7-11; 3 ♂, Khao Nok Wua, September 26-October 19; 2 ♂, 2 ♀, Khao Luang, August 9-16; 4 ♂, ♂ imm., 2 ♀, Khao Bhanam Bencha, August 2-September 16; ♀, Waterfall, Trang, October 8.

In general color these birds are very like those from northern or central Siam, but are at once distinguishable, because the Trang males all have no red on the outer web of the third primary, while those from farther north do have it. Birds from Khao Luang, Khao Nok Wua, Ban Thung Luang and Keng Sok, show an approach to *elegans* in that from the first two localities two have the third primary black and one has a spot of red on it, and from the last two localities three have black third primaries while two have a red spot.

In the color of the central rectrices birds from Trang have the inner web black, the outer red, but in birds from farther north on the peninsula the coloration is very unstable. Thus from Khao Luang and Khao Nok Wua four males are like Trang birds, one has the basal third of the outer web black, another has the tip of the outer web red. From Keng Sok and Ban Thung Luang, two have the outer web red, one has the whole tip black on one rectrix, and red with a black spot on the other, two have the whole

tip red, while another has the central rectrices as in *bakeri*, but with considerable black at the base of the other tail feathers.

This series measures as follows: Ban Thung Luang and Keng Sok, 5 ♂, wing, 91-95, tail 77-80, 2 ♀ wing 93, 93, tail 77-81; Khao Luang, and Khao Nok Wua, 5 ♂, wing 87-95, tail 76-80, 2 ♀, wing 86, 87, tail 76, 76; Trang, 5 ♂, 87-91, tail 70-79, 3 ♀, 87, 87, 88, tail 75, 77, 77 mm.

Pericrocotus roseus subspecies

2 ♂, Chanuman, January 29, February 2; ♀, Wat Pa, November 2.

The two males differ from a north Siam series by having the lower parts more of a washed out pink, especially in one; the throat white, hardly tinged at all with pink, and the rump, upper tail-coverts pinkish gray, the feathers tipped with orange-scarlet instead of solid orange-scarlet.

They are not immature for they show no remains of the yellow immature plumage.

The female from Wat Pa has the upper tail-coverts grayish, hardly tinged at all with yellow-olive. More material may show these birds to belong to a race breeding in another region than *roseus*. They are not *stanfordi* Vaughn and Jones for they have no frontal patch and partial collar on the neck.

Pericrocotus roseus cinereus Lafresnaye

♂, 2 ♀, Kratt, November 24-28; ♀, Chanuman, January 22; 2 ♀, Wat Pa, October 15.

Pericrocotus roseus cantonensis Swinhoe

2 ♀, Kemraj, December 30, January 4; 4 ♂, Chanuman, January 8-February 2; 2 ♀, Keng Sok, March 4, 8.

One male from Chanuman differs from the others by having the wing markings orange-pink. This bird must be some sort of intermediate, perhaps between this race and *stanfordi*.

Pericrocotus peregrinus vividus Baker

2 ♂, ♂ juv., 3 ♀, Srisawat, July 1-7; ♂, Khulu, December 19; 5 ♂, ♀, Chanuman, January 8-February 9; ♂, Khao Luang, September 9.

The juvenile male has the feathers of the entire upper surface margined with white giving it a scaled appearance.

Hemipus picatus picatus (Sykes)

2 ♂, ♀, Wat Pa, October 17-November 11; ♀, Srisawat, July 13; ♀, Pran, March 17; 4 ♂, Kemraj, December 30-January 4; 2 ♂, 3 ♀, Chanuman, January 9-22; ♂, ♀, Kratt, December 1-4; 4 ♂, ♀, Ban Thung Luang, January 14-22; ♂, Khao Bhanam Benchu, August 4; ♂, Nong Tao, January 6.

All of these belong to the black-backed form. The distribution of *pictatus* and *capitalis* is very puzzling. Specimens of the two forms in our collection, in addition to the above recorded ones, are as follows: *pictatus*, Dudaw Taung and Mt. Victoria, Chinn Hills; Tamuang, Sriracha, Pak Chong, Chantaboon, Chieng Rai; *capitalis*, Loi Mwe, Keng Tung, Southern Shan States; Chieng Sen, Pha Hom Pok, Chieng Dao, Chieng Mai.

***Tephrodornis pondiceriana thai* Kloss and Chasen**

♂, Srisawat, July 6; 2 ♀, Chanuman, January 6, 24; ♂, ♀, Khulu, December 20-22.

The male from Srisawat, perhaps not fully adult, has the superciliaries brownish gray, rather than white as in the rest of the series, including two additional females from Me Poon, very near the type locality.

***Tephrodornis gularis annectens* Robinson and Kloss**

2 ♂, 4 ♀, Khao Bhanam Bencha (3500 ft.), August 4-September 10; ♀, Waterfall, Trang, October 7; ♀, Khao Nok Wua, October 25.

The wings and tails of this series measure ♂, 103, 106; 68, 72, ♀, 105, 110, 112 (4); 69, 70, 73 (3), 75 mm.

***Tephrodornis gularis mekongensis* new subspecies**

TYPE.—♀, ad., A.N.S.P. no. 126923, collected at Chanuman, Ubon Province, eastern Siam, by Lucas Bah, on January 24, 1936.

Description.—Differs from the female of *T. g. vernayi* Kinnear by having the upper surface much grayer, the lower surface grayer but not paler.

Differs from the female of *T. g. annectens* Robinson and Kloss by larger size, somewhat grayer upper surface, especially the pileum, and paler under surface.

Measurements of type.—Wing 116, tail 78, culmen 20 mm.

Range.—Eastern Siam from Wat Pa and Bua Yai, southward to Chanuman and Chantaboon, and probably Bas Laos, Cochinchina, Cambodia and Annam.

Remarks.—The male of this form is very like *annectens*, but is paler below, and the upper surface averages grayer, in fact, in two specimens the mantle is almost pure ash-gray with no brown tinge.

Specimens examined, and measurements.—*T. g. vernayi*, Chinn Hills, ♂, wing 116, tail 75; Keng Tung, Southern Shan States 2 ♀, wing 123, 124, tail 84, 88; Thongyin, Tenasserim ♂, wing 116, tail 80; northern Siam (Chieng Mai, Metang, Khun Tan), wing ♂, 113 (worn), 116, 117, 117, 118, 119, 120, tail 78, 78, 81, 82, 84, 84, 85; ♀, wing 111 (imm.), 113, 115, 116, 116, 117, 117, 118, 120, tail 77, 78, 80, 84, 84, 85, 86; Srisawat, ♀ imm. wing 110, tail 84 mm.

T. g. annectens, Trang, ♂, wing 103, 107, tail 68, 78, ♀, wing 100, 102, 103, 105, 112, tail 71, 71, 73, 74, 76; Khao Nok Wua, ♀, wing 112, tail 75 mm. (intermediate in size and color between *annectens* and *vernayi*).

T. g. mekongensis, Wat Pa, ♂, wing 113, 114, 115, 119, tail 78, 80, 82, ♀, wing 115, tail 73. Bua Yai, ♀ imm., wing 109, tail 80; Chanuman, ♂ imm., wing 109, tail 80; Chanuman, ♂, wing 118, tail 80, ♀, wing 115, 117, 117, 118, tail 77, 82, 83, 85; Chantaboon, ♂, wing 114, tail 82, ♀, wing 111, tail 84. Khao Soi Dao, ♀, wing 112 (worn), tail 82 mm. Extreme measurements: *vernayi* ♂, ♀, wing 113-124, tail 78-88; *mekongensis* ♂, ♀, wing 113-119, tail 73-85; *annectens*, ♂, ♀, wing 100-112, tail 68-76 mm. Only adults are given.

***Campephaga fimbriata polioptera* Sharpe**

3 ♂, 2 ♀, Chanuman, January 6-February 9; ♂, Kemraj, January 6; 2 ♀, Wat Pa, November 3; 3 ♂, ♀, Srisawat, July 9-12; ♀, Keng Sok, March 6; ♂, Khao Luang, August 31.

The birds from Khao Luang and Keng Sok are typical of this form which resembles *melanoptera* in color, but differs by its shorter wing.

***Campephaga fimbriata neglecta* (Hume)**

2 ♂, ♀, Khao Bhanam Bencha, August 12-September 13; ♀, Kapang, January 2.

This small form resembles *melaschista* in color but has a much shorter wing.

***Campephaga fimbriata melanoptera* (Rüppell)**

♂, Wat Pa, October 20; ♂, ♀, Chanuman, January 25; ♂, Khulu, December 25; ♂, 3 ♀, Kratt, November 28-December 8.

Two males from Chieng Mai, one taken December 28, 1928, the other taken December 28, 1932 (!) agree with the above series and four males Mokanshan, Chekiang and Kiangyin, Kiangsu, in being paler, less slaty-gray, than five examples from Chieng Mai and Chieng Sen which I regard as belonging to the following subspecies. I believe them to be stragglers of the China form.

***Campephaga fimbriata melaschista* Hodgson**

♂, Wat Pa, October 27.

***Coracina novaehollandiae siamensis* (Baker)**

♂, ♀, Srisawat, July 6, 10; ♀, Wat Pa, October 6; ♂, Khulu, December 12; ♂, ♀, Chanuman, February 8, 9; ♂, Khao Sabab, June 15.

Three males and three females from Keng Tung differ from 28 Siamese specimens by being darker. The males have blackish gray throats and fore-chests, instead of blue-gray and the females are darker above. They also have larger bills, and the wings are all near the maximum for Siamese birds. I believe them to represent *C. n. rex-pinetti*, Swinhoe, a form which I do not think has been recorded from Burma.

Unfortunately we have no Formosan material for comparison, but Yen (L'Ois., 1934, p. 304) has compared south China birds (*mellianus* Stres.) with Formosa examples and could not distinguish mainland birds from birds from that island. La Touche has also synonymized *mellianus* and calls birds from Yunnan *rex-pineti*.

One specimen from Doi Suteb approaches Keng Tung birds in coloration but it has a small bill and a shorter wing and must be regarded as an exceptionally dark *siamensis*.

A male from Pha Hom Pok is typical of the Siamese race as is a pair from Dudaw Taung, Chinn Hills.

DICRURIDAE

Dicrurus annectens annectens (Hodgson)

♂, Keng Sok, March 5; ♀, Khao Luang, August 27; ♂, Waterfall, Trang, October 7.

Dicrurus macrocercus cathoecus Swinhoe

♂, ♀, Wat Pa, October 5, 10.

I follow Deignan in calling these birds *cathoecus* in default of comparative material. They measure, ♂, wing 142, tail 174; ♀, wing, 132, tail broken.

The tail in the male is very long, but compared to a male of *albirictus* the gloss on the mantle and especially the tail is much greener, less blue, in this agreeing with Chinese birds.

Dicrurus leucophaeus leucogenys (Walden)

♂, ♀, Kratt, November 27, 28; ♂, Chanuman, January 8.

This is *D. l. cerussatus* Bangs and Phillips of authors.

Dicrurus leucophaeus (? *salangensis* Reichenow)

2 ♂, ♀, Kratt, December 1.

Much darker above, and with a shorter wing than the pale gray birds mentioned above.

The nomenclature of white-cheeked drongos is rather scrambled, and for a discussion of it see Deignan (Bull. U. S. Nat. Mus., 186, 1945, p. 289). An example from the Malay Peninsula collected by E. Oates agrees in color with these birds, as do specimens from Sriracha, and Meklong. From Petriu we have an example of each form, taken the same day.

Dicrurus leucophaeus mouhoti (Walden)

2 ♂, 4 ♀, Chanuman, January 9-February 8; ♂, Khulu, December 24; ♂, Kratt, December 5; ♀, Rayong, October 14; ♂, Pran, March 17; ♂, Ban Thung Luang, January 19.

The wing of the Ban Thung Luang bird measures 140 mm., tail 145 mm., and I see no character by which it differs from *mouhoti*.

Dicrurus leucophaeus bondi de Schauensee

♂ (type), ♂, Chanuman, January 7, 8; ♂, Khulu, December 22.

This bird was described as a species, the breeding range at that time not being known. Since then *bondi* has been taken at Me Poon, August 31, and at Me Lam Phan, September 9. Deignan informs me that the U. S. National Museum has it from Raheng (August).

*Deignan believes that this is the lowland breeding bird of central Siam, while *mouhoti* breeds in the hills. He further tells me that *bondi* ranges from southern (and central?) Annam, westward to the Me Ping, south of Lat. 17° 47' N. How far it ranges southwards in western Siam is unknown. *Bondi*, a small pale form, is much rarer than *mouhoti*. *Dicrurus rocki* described from Annam by Riley is apparently a synonym of *bondi*.

Dicrurus hottentottus hottentottus Linnaeus

♀, Wat Pa, November 6; 3 ♂, Chanuman, January 22; ♂, ♀, Khao Nok Wua, September 31.

The southernmost recorded locality for this form is Khao Nok Wua.

Chaptia aenea malayensis Blyth

2 ♂, Srisawat, July 14, 18 (very worn); ♂, ♀, Wat Pa, October 21 (moulting); ♂, Rayong, October 20; 3 ♂, ♀, Chanuman, January 13-27; ♂, Khulu, December 25; ♂, 2 ♀, Khao Soi Dao, May 14-18 (moulting); ♂, Khao Sabab, June 17; ♀, Khao Nok Wua, October 3; 2 ♂, Khao Luang, August 28, September 7 (both in full moult).

Bhringa remifer tectirostris Hodgson

♂, ♀, Wat Pa, October 16, 23; ♀, Kemraj, January 3.

I know of no other records for central and eastern Siam. Wat Pa birds are like those from northern Siam. It is possible that the specimen from Kemraj belongs to another form but unfortunately the long tail feathers are missing so it seems best to place it with *tectirostris*.

Dissemurus paradiseus paradiseus (Linnaeus)

♂, Srisawat, July 11; 3 ♂, Wat Pa, October 10-November 6; ♀, Khulu, December 26; 2 ♀, Chanuman, January 8, 17; ♂, Tap Chang, April 28; ♂, 2 ♂ juv.; ♀, Khao Soi Dao, May 9-26; ♀, Khao Sabab, June 12; ♂, Kratt, December 4; ♂, 3 ♀, Khao Nok Wua, September 1-October 10; 3 ♂, Khao Luang, August 14-22.

Birds from Srisawat and Wat Pa have larger crests than the rest of the series, thus showing an approach to *rangoonensis*.

Dissemurus paradiseus malayensis (Blyth)

2 ♂, Kapang, January 3, 4; ♀, Nong Tao, January 5; 7 ♀, Khao Bahnam Bencha, August 5-September 18.

ORIOLIDAE***Oriolus chinensis diffusus* Sharpe**

7 ♂, 2 ♀, Wat Pa, October 6-November 14; ♂, ♀, Khao Nok Wua, September 27; 2 ♂, Ban Thung Luang, January 1, 10; 2 ♂, Hua Mak, December 23, 27; ♀, Kratt, November 25.

***Oriolus xanthornus xanthornus* (Linnaeus)**

4 ♂, 2 ♀, Srisawat, June 29-July 7; ♂, 2 ♀, Wat Pa, October 12-16; 2 ♂, 2 ♀, Chanuman, January 8-February 1; 4 ♂, Khulu, December 19-25; ♀, Khao Soi Dao, May 11; ♂, Keng Sok, March 9; ♂, 3 ♀, Khao Luang, August 30.

Birds from Srisawat are in post-nuptial moult.

***Oriolus xanthonotus xanthonotus* Horsfield**

3 ♂, 3 ♀, Khao Bhanam Bencha, August 19-September 9; ♀, Waterfall, Trang, October 6; ♀, Nong Tao, January 5.

***Oriolus mellianus* Stresemann**

2 ♀, Kratt, December 6; ♂, imm., Ban Thung Luang, January 11.

The taking of an immature male of this wonderful species at Ban Thung Luang, extends the winter range of the bird to the northern Malay Peninsula.

The plumage resembles that of the female. The soft parts are marked as follows: "eyes reddish; upper beak black."

CORVIDAE***Corvus splendens insolens* Hume**

2 ♂, Pran, March 14.

Apparently very rare in Siam, in which country only four specimens have been previously collected.

Williamson (*Ibis*, 1945, pp. 57-58) gives an interesting resumé of the history of the four Siamese birds.

On the evening of my first arrival at Chieng Rai, while driving through the village to the rest house, what I was sure was a Magpie flew overhead. On subsequent visits I looked for the bird, but never saw one there again. This was on January 5, 1929.

***Urocissa erythrorhyncha magnirostris* (Blyth)**

♂, 4 ♀, ♀ imm., Srisawat July 3-11; 3 ♂, Wat Pa, October 10, 24; ♀, Khulu, January 2; ♀, Kemraj, December 29.

Birds from Khulu, Kemraj and Wat Pa are whiter below than the average northern bird or the adult from Srisawat. In these the lower surface is heavily overlaid with blue. One male from Chieng Mai is close, however, to eastern birds. With long series the two may prove separable.

Kitta hypoleuca hypoleuca Giglioli and Salvadori

♂, Khao Soi Dao (3500 ft.), May 6.

A fine, adult specimen. The iris, bill, feet and legs are recorded as "red."

Kitta chinensis chinensis (Boddaert)

♂, ♀, Srisawat, July 13; ♂, Keng Sok, March 7; ♀, Ban Thung Luang, January 16; 2 ♂, 4 ♀, Khao Nok Wua, October 3-17; ♂, ♀, Khao Luang, August 20, September 15.

Birds from Srisawat are in worn plumage; all those from Khao Nok Wua are in heavy moult. The specimen from Ban Thung Luang is in fresh plumage.

Birds from Khao Luang extend the range of this species slightly to the southward.

Crypsirina vagabunda sakeratensis Gyldenstolpe

♂, ♀, Wat Pa, October 28; 3 ♀, Chanuman, January 7-February 9; 2 ♂, ♀, Khulu, December 24-26.

Wat Pa birds agree with this form by having darker hoods than north Siam birds.

Crypsirina cucullata seems to connect the "*Dendrocitta*" type of bird with *Crypsirina*.

Crypsirina temia (Daudin)

2 ♂, Wat Pa, October 18; ♂, Srisawat, July 11; ♂, Chanuman, Jan. 3; ♀, Khulu, January 2; ♂, 2 ♀, Khao Nok Wua, October 3-17.

Three males from Java have wings of 111-119 mm.; two females 108, 114 mm.

Garrulus glandarius leucotis Hume

2 ♂, ♀, Srisawat, June 30-July 9 (moulting); ♂, 2 ♀, Khulu, December 17; ♀, Kemraj, December 31; 2 ♂, Chanuman, January 8, February 4.

Platylophus galericulatus ardesiacus (Bonaparte)

♂, ♀, Keng Sok, March 8; ♂, Ban Thung Luang, January 21; 3 ♂, ♀, Khao Luang (3400 ft.), August 6-26; 4 ♂, 3 ♀, Khao Bhanam Bencha (3500 ft.), August 5-September 23; ♀, Kapang, December 31.

PARIDAE**Parus major templorum** de Schauensee

(Not. Nat., no. 169, p. 2, 1946, Wat Pa.)

2 ♂, Wat Pa, October 21; 4 ♂, ♀, Chanuman, January 7-February 9; ♂, ♀, Khulu, December 19, 20.

Melanochlora sultanea flavocristata (Lafresnaye)

10 ♂, 2 ♀, Wat Pa, October 12-November 3; 2 ♂, 2 ♀, Srisawat, June 4-July 6; 2 ♂, Ban Thung Luang, January 16-23; 2 ♂, 3 ♀, Khao Luang

(3400 ft.), August 8-September 15; 2 ♂, 2 ♀, Khao Nok Wua (2000 ft.), September 24-30; 2 ♀, Khao Bhanam Bencha (3500 ft.), August 25, 29; 4 ♂, 2 ♀, Waterfall, Trang, October 3-6.

Wat Pa males have wings of 103-112 mm., three females 100-102 mm.

SITTIDAE

Sitta castanea neglecta Walden

3 ♂, 2 ♀, Srisawat, July 8-12; 7 ♂, 2 ♀, Chanuman, January 9-25; ♀, Khulu, December 20; 2 ♂, Kemraj, January 6.

Eastern birds agree in size and color with those from northern Siam.

Sitta frontalis corallina Hodgson

4 ♀, Srisawat, June 29-July 4; 4 ♂, Wat Pa, October 31-November 4; ♀, Khulu, December 22; ♀, Ban Thung Luang, January 24; 2 ♂, 3 ♀, Keng Sok, March 7-12; 5 ♂, 2 ♀, Chanuman, January 9-26.

Birds from Keng Sok and Ban Thung Luang show no approach in color to *saturation*.

Sitta frontalis saturation Hartert

4 ♂, Khao Bhanam Bencha, August 2-September 14.

PYCNONOTIDAE

Irena puella puella (Latham)

♂, ♀, Wat Pa, October 30; 3 ♂, 3 ♀, Rayong, October 12-19; 4 ♂, Khao Soi Dao, (3500 ft.), May 3-30; 2 ♀, Khao Sabab, June 12, 24; 2 ♂, 3 ♀, Kratt, November 26-December 6; ♂, 5 ♀, Khao Nok Wua (2000 ft.), September 22-October 4; 2 ♂, 4 ♀, Khao Luang, August 19-September 30; 2 ♂, Waterfall, Trang, October 6, 8; 3 ♂, 3 ♀, Khao Bhanam Bencha, August 6-21; 4 ♂, Nong Tao, January 7-13.

Aethorhynchus lafresnayei innotatus (Blyth)

3 ♂, 3 ♀, Wat Pa, October 17-November 2; ♂, Keng Koi, May 6; ♀, Khao Soi Dao (3500 ft.) May 13; ♂, Khao Sabab, June 24; ♂, Keng Sok, March 12; ♂, 2 ♀, Khao Luang, August 15-September 15; ♂, Ban Thung Luang, January 12.

The soft parts for a male from Khao Luang are noted, "eyes light gray; bill blue-gray; legs blue-gray". A female from Khao Soi Dao has the eyes noted as "light brown".

Aethorhynchus lafresnayei lafresnayei (Hartlaub)

4 ♂, 3 ♀, Khao Bhanam Bencha (3000 ft.), August 19-September 12.

Aegithina tiphia tiphia (Linnaeus)

♀, Wat Pa. November 1; 3 ♂, Srisawat June 28-July 1; ♂, 2 ♀, Chanuman, February 13; ♂, ♀, Khulu, December 21, 23; ♂, Khao Luang (3400 ft.), September 5; ♂, Tap Chang, April 28.

The wings of these birds run up to 68 mm. (Srisawat).

Aegithina viridissima viridissima (Bonaparte)

♂, ♀, Khao Bhanam Benchha, August 28, September 4.

Chloropsis aurifrons inornatus Kloss

2 ♂, 2 ♀, Wat Pa, October 8-November 3; 2 ♂, ♀, Kemraj, January 2-February 5; 3 ♂, ♀, Khulu, December 20-25; 2 ♂, ♀, Chanuman, January 8-February 15; 3 ♂, 3 ♀, Srisawat, June 29-July 7; ♂, Rayong, October 22; ♂, Keng Sok, March 10; 3 ♂, Khao Nok Wua, October 4, 5; 2 ♂, Khao Luang (3400 ft.), August 31, September 7.

Chloropsis sonnerati zosterops Vigors

♀, Waterfall, Trang, October 8; ♀, Khao Bhanam Benchha (3500 ft.), August 25; ♂, ♀, Khao Nok Wua (2000 ft.), September 26; 2 ♂, 2 ♀, Khao Luang (3400 ft.), August 22.

Chloropsis cochinchinensis cochinchinensis (Gmelin)

4 ♂, ♀, Wat Pa, October 20-November 2; ♀, Srisawat, July 4; 4 ♂, 2 ♀, Chanuman, January 28-February 6; ♂, ♀, Khulu, December 19; 3 ♂, ♀, Kratt, December 2-8; 4 ♂, 2 ♀, Khao Soi Dao (3500 ft.), May 7-24; 2 ♂, ♀, Khao Sabab (3000 ft.), June 11-14; ♀ juv., Keng Sok, March 7; ♂, Ban Thung Luang, January 15; 3 ♂, 4 ♀, Khao Nok Wua (2000 ft.), September 24-October 3; 4 ♂, 4 ♀, Khao Bhanam Benchha, August 2-September 20; 2 ♂, Kapang, January 3, 6.

Birds from Trang show no approach toward *icterocephala* recorded from Patani, and are indistinguishable from specimens taken in the Chinn Hills.

Pycnonotus eutilotus (Jardine and Selby)

2 ♂, Khao Bhanam Benchha, August 18, September 9.

Although *Spizixos canifrons* does not occur in the region dealt with in this paper, I feel the following note should be included here.

Since 1934 we have received *Spizixos canifrons* from Mt. Victoria, and an examination of these four specimens shows the Siamese bird is different and must be called *ingrami* and not *canifrons*.

We have one specimen from Kyu Loi, Keng Tung, Southern Shan States, and 14 from Pha Hom Pok, northern Siam. All of these are very consistent in having ash-gray cheeks and ear coverts and dark gray throats. The four from Mt. Victoria, identified by Stressmann as *canifrons*, have the cheeks and ear coverts much browner, and the throat slightly so. A bird from Muli, Szechwan, is intermediate but closer to *canifrons*. These are exactly the characters by which Mengtze birds were separated by Bangs and Phillips, but since the description of *ingrami*, the name has rather generally been discarded.

Delacour later described *laotinus* but Bangs and Van Tyne compared 6 specimens from Laos with the type and 21 specimens of *ingrami* and found its characters neither consistent, nor well enough marked to justify its recognition (Field Mus. Nat. Hist., Zool. ser. 18, no. 3, 1931, p. 91).

Pycnonotus atriceps cinereoventris (Blyth)

♂, Chanuman, February 6; ♀ imm., Khao Sabab, June 6; 5 ♂, ♀, o, Rayong, October 11-20; ♂, Khao Nok Wua, (2000 ft.) September 27; 4 ♂, 3 ♀, Khao Luang (3400 ft.), August 10-13; 2 ♂, ♂ imm., 3 ♀, Khao Bhanam Bencha (3500 ft.), August 2-September 19; 2 ♂, 2 ♀, Waterfall, Trang, October 3-6.

Measurements seem to show that birds from Trang northward belong to one form. Two males from Java have wings of 73 each, two females 73, 74.5 mm. Sumatra birds are a trifle larger. The wings of these males measure 75, 76, 76, three females 74, 76, 77.5, three not sexed 74, 74.5, 75. Wing measurements of Siamese birds are as follows: Trang, 4 ♂, 77-81, 4 ♀, 75-77; Khao Luang and Khao Nok Wua, 5 ♂, 76-82, 3 ♀, 75-78.5; Rayong, 5 ♂, 73.5-79, ♀ 77.5; Chanuman ♂, 79; Sriracha ♂, 78; Chantaboon, ♀, 74; Nakon Nayok ♂, 76.5; Chiang Mai and Chiang Sen, 2 ♂, 79, 82.5; 2 ♀, 77-79.

Pycnonotus dispar johnsoni (Gyldenstolpe)

♂, ♀, Pak Chong, May 10, 18; o, Nakon Nayok, June 6; ♂, Keng Koi, February 23.

The opportunity to see a very distinct subspecies, which not long ago would have been considered a good species, actually evolving before our eyes is an opportunity of rare occurrence. This, however, is actually taking place now in eastern Siam.

Gyldenstolpe's *johnsoni* is a mutant of the black-throated *flaviventris* in which the throat is red instead of black. Otherwise in size and color it resembles *P. d. minor* (Kloss) from which black-throated examples are indistinguishable. This red-throated mutant has become established in a small area on the Korat plateau, northeast of Bangkok. A large majority of birds from there have red throats. In fact, the normal black-throated bird is distinctly rare.

The history of this most interesting bird is as follows: in January, 1912, Gyldenstolpe collected the type (♂) at Sakerat, a village a few miles to the south of Korat. At the moment he collected the type he saw another bird with it which also had a red throat (Kungl. Sven. Vet. Hand., 56, no. 8, 1913, p. 25 and pl. 1).

In 1915 E. G. Herbert collected two males and a female at Pak Chong, three males and two females at Hin Lap and two males and two females at Krabin.

A short time afterwards (1916) Kloss collected at Lat Bua Kao four males, four females and two juvenile females. He and Baker then engaged in a lively discussion as to the identification of their birds. Baker recorded his specimens as *johnsoni*, but included black-throated birds from Hup Bon, (near Sriracha), and Klong Wang Hip and Klong Bang Lai in peninsular Siam. Baker did not state clearly which of his birds had red throat and which black, but specifically referring to specimens from Hin Lap he said, "In one instance of four birds shot all together at Hin Lap on the 8th December, two have red throats and two have black, shewing no trace of red. Another specimen has the throat entirely black except for one red feather." (Journ. Nat. Hist. Soc. Siam, 3, 1919, p. 195.) Kloss immediately questioned the correctness of using the name *johnsoni* for black-throated birds (*minor* Kloss), particularly for birds from southwest Siam (t. c., pp. 194, 195). Kloss then heard from Baker that only those birds from Pak Chong and its neighborhood and Krabin were red-throated, and that all the rest from Hup Bon, Klong Wang Hip and Klong Bang Lai were black-throated (t. c., 4, pp. 51, 52, 1921).

In the meantime Gyldenstolpe published a list of the Birds of Siam (Ibis, 1920) and evidently believing all the birds recorded by Baker to have red throats, included peninsular Siam, south to Nakon Sritamarat (Klong Wang Hip is in that province), in the range of *johnsoni* (Ibis, 1920, 492).

Kloss, writing of the color of the throat of his series from Lat Bau Kao, made this interesting statement, "The individuals in my series vary considerably in the size and color of the red area—perhaps because they were collected in the moulting season,—and it is only by careful examination of one male in moult that any indication of the red colour can be found, for, save for a minute spot of red on two or three of the feathers, the throat is black, though the feathers are still rather glistening. In other specimens in moult the throat patch is small and the feathers are party-colored black and red, and it is probably only after several moults that the pure glistening red throat is attained; otherwise we must assume that the feathers change color during their growth.

"In two young birds the throat is clad with soft, dull, yellow feathers beset with three or four of glistening orange-red; the heads of these birds are brown, sprinkled with the black feathers of the mature plumage". (Ibis, 1918, pp. 201, 202.)

In 1934 (Proc. A.N.S.P., 86, pp. 203, 204) believing that Gyldenstolpe had red-throated birds from Nakon Sritamarat, and because in eastern Siam black-throated birds, indistinguishable from *minor* from the peninsula, occurred together with red-throated ones, I regarded *johnsoni* as

only a color phase and as that name was older than *minor*, used it for all the smaller southern examples of *flaviventris*. Since that time we have received additional material from eastern Siam, and I have lately discussed the subject with H. G. Deignan, and now feel that my previous view of the matter was wrong, and that both *minor* and *johnsoni* should be recognized, even if "*johnsoni*" crops up within the range of *minor* in eastern Siam, and "*minor*" appears within the range of *johnsoni*. The latter has a limited distribution in east-central Siam, roughly from the neighborhood of Korat south to Krabin and west to Pak Chong. Within this area the vast majority of birds are typical *johnsoni*, while the surrounding country is occupied by a population which is just as predominantly *minor*.

In Indo-China Bangs and Van Tyne record a bird with a few red feathers on the throat from Vientiane, Laos (Field Mus. Nat. Hist., Pub. 290, p. 91, 1931). Delacour writes me that red throated birds are found as far to the northeast as Tonkin, but that in that province they are excessively rare.

It is most interesting to find that taking northern India and Burma as the hypothetical original home of black-throated birds (*flaviventris*) we find on the periphery of the range a disposition to acquire a red throat. Thus *gularis* of southwest India has a red throat, *dispar* of Java and Sumatra likewise has it red and *johnsoni* in eastern Siam has also acquired this character. It is interesting to speculate whether once both *dispar* and *gularis*, both of which now are 100 percent red-throated, were once black-throated and whether at some future time the entire population of eastern Siam will also be red throated. It is obvious that it will be very important to keep accurate records of the frequency of the occurrence of red-throated birds in eastern Siam, in trying to determine whether they are on the increase in the territory now surrounding the area occupied by *johnsoni*.

Riley in 1938 listed a considerable series of *johnsoni*, treating it as a distinct species (Bull. 172, U. S. Nat. Mus., p. 388). His specimens were recorded as follows: two females from Knong Phra (near Pak Chong), four males and eight females from Pak Chong, one male from Pang Sok, one not sexed from Tha Chong, two males and two females from Lat Bua Kao, and three females from Hin Lap. Of these Riley states only one had some black feathers mixed with the red ones on the throat, the rest being red throated. A young female taken at Lat Bua Kao had the throat yellow, "the red coming in without the intervening black stage".

I do not believe, as most authors seem to, that individuals which have the throat feathers mixed red and black are immature; rather that *johnsoni*, a species "in the making," is still unstable in this character. Young birds

mentioned by both Kloss and Riley had yellow throats with the red coming in. In birds from Wat Pa and Chanuman (*minor*), fully adult specimens are occasionally found with red feathers mixed with the black ones.

The study of the development of *johnsoni* will be a fascinating study for ornithologists of future generations, for the discovery of a subspecies in what might be called its "infancy" is rare indeed.

***Pycnonotus dispar minor* (Kloss)**

♂, Srisawat, July 11; 4 ♂, 5 ♀, Wat Pa, October 12-November 7; 0, Khulu, December 21; ♂, Kemraj, January 2; ♂, 4 ♀, Chanuman, January 17-February 7; ♂, Khao Soi Dao, (3500 ft.), May 16; ♀, Khao Sabab (3000 ft.), June 12; ♂, ♀, Kratt, November 25, 30; 4 ♀, Rayong, October 13-16; ♂, 2 ♀, Khao Luang (3400 ft.), August 7, 8; 3 ♂, ♀, Khao Bhanam Bencha (2000 ft.), August 3-September 6.

All the above birds are black throated, with the following exceptions: ♂, Khao Soi Dao, four or five red feathers; ♀, Rayong, considerable red mixed with the black; 2 ♀, Chanuman, a trace of red, ♂, typical of *johnsoni*; ♀, Wat Pa, typical of *johnsoni*.

A large series from northern Siam, Keng Tung and the Chinn Hills does not show a trace of red on the throat. I have never seen a bird from west of Me Nam Chao Phya with a red throat and to date there is no record of such a bird from west of that river. The presumption that such birds occurred there can be traced to Baker's paper in the Journal of the Siam Natural History Society written in 1919.

Of birds from northernmost Siam, a large series examined, have wings in males measuring between 84 (= ? ♀), 86-91 mm. and should be referred to *flaviventris*. *Minor* has a wing running up to 87 mm., but this size is rarely attained except in the northern part of its range. *Johnsoni*, in wing length is similar to *minor*.

***Pycnonotus squamatus webberi* (Hume)**

♂, Waterfall, Trang, October 8.

The soft parts are recorded as follows: "eyes orange; beak and legs black."

***Pycnonotus cyaniventris cyaniventris* (Blyth)**

3 ♂, 2 ♀, Khao Bhanam Bencha (3500 ft.), August 12-September 11.

***Pycnonotus jocosus erythrotis* (Bonaparte)**

♀, Khao Nok Wua, October 14; ♂, Khao Bhanam Bencha, September 9; ♂, ♀, Waterfall, Trang, October 10.

A specimen from Pha Hom Pok is abnormal in having the red feathers below one eye completely lacking, while they are present under the other one.

***Pycnonotus cafer schauenseei* Delacour**

♂ (Type, field number 1369, A.N.S.P. no. 123999), 3 ♂, ♀, Srisawat, July 2-9.

Birds from Sriracha and Nakon Nayok agree with Srisawat birds in having orange under tail-coverts.

***Pycnonotus cafer germaini* Oustalet**

2 ♂, 5 ♀, Chanuman, January 11-February 13; 2 ♂, ♀, Khulu, December 18-19.

This brown-headed form has not been taken previously in Siam, with the possible exception of Gyldenstolpe's birds from Sakerat. Riley's record from Chantaboon belongs to *deignani* Delacour.

***Pycnonotus zeylanicus* (Gmelin)**

♂, Nong Tao, January 6; 2 ♂, Waterfall, Trang, October 4.

***Pycnonotus finlaysoni finlaysoni* Strickland**

♂, Srisawat, June 29; 2 ♂, 2 ♀, Wat Pa, October 5-November 7; 4 ♂, Chanuman, January 14-February 1; ♀, Khulu, December 18; ♀, Khao Soi Dao (3500 ft.), May 14; 2 ♂, ♀, Kratt, December 1-9; ♂, Khao Sabab, June 20; ♂, Rayong, October 23; ♀, Keng Sok, March 8; 3 ♂, Ban Thung Luang, January 16-20; ♂, Khao Nok Wua, September 25; 4 ♂, Khao Luang (3400 ft.), August 10-September 15; ♂, ♀, Khao Bhanam Bencia, August 3-September 16.

***Pycnonotus goiaver personatus* (Hume)**

2 ♀, Rayong, October 10-17.

***Pycnonotus blanfordi conradi* (Finsch)**

♀, Srisawat, July 13; ♂, ♀, Wat Pa, November 5, 8; ♂, 2 ♀, Kemraj, December 30-January 2; ♀, Chanuman, January 30; 2 ♂, ♀, Khao Luang (3400 ft.), August 31-September 13.

***Pycnonotus simplex simplex* Lesson**

2 ♂, Khao Bhanam Bencia (3500 ft.), August 16, 24.

***Pycnonotus brunneus brunneus* Blyth**

9 ♂, 4 ♀, Khao Bhanam Bencia (3500 ft.), August 2-31; ♂, 2 ♀, Waterfall, Trang, October 5-9.

Although *Pycnonotus plumosus* is said to be common in this region no specimen was secured.

***Pycnonotus erythroptalmus erythroptalmus* (Hume)**

♂, 2 ♀, Khao Bhanam Bencia, (2000-3500 ft.), August 10-September 6; ♀, Waterfall, Trang, October 4.

***Criniger tephrogenys tephrogenys* (Jardine and Selby)**

5 ♂, 6 ♀, Khao Bhanam Bencia (3500 ft.), August 4-September 19; 2 ♂, Waterfall, Trang, October 8.

***Criniger tephrogenys annamensis* Delacour and Jabouille**

♀, Chanuman, February 8; 2 ♂, 2 ♀, Wat Pa, October 19-31.

Not previously recorded from Siam. Although I have not compared them with birds from Annam, these specimens agree with the description of *annamensis* in having the under parts deep yellow.

***Criniger ochraceus ochraceus* Moore**

♂, ♀, ♀ imm., Khao Soi Dao (3500 ft.), May 1-30; 2 ♂, ♀, Khao Sabab (3000 ft.), June 7-21; 6 ♂, ♀, Kratt, November 25-December 9; ♂, ♀, Rayong, October 12, 21; ♂, 2 ♀, Khao Luang (3400 ft.), August 5-7; ♀ imm., Khao Bhanam Benchha, August 10.

Birds in worn plumage become paler and more ochraceous below, losing the grayish bloom to the feathers of the under surface which is present in freshly moulted specimens.

Birds from the mountains of southeastern Siam are not different from lowland specimens.

***Microscelis criniger criniger* (Blyth)**

5 ♂, ♀, Khao Bhanam Benchha (3500 ft.), August 4-September 5; ♀, Waterfall, Trang, October 7.

The soft parts of a male are recorded as, "eyes light brown; legs light yellow; beak light gray."

***Microscelis charlottae brunnescens* (Finsch)**

3 ♂, ♀, Khao Bhanam Benchha (up to 3500 ft.), August 2-September 10; ♂, Nong Tao, January 6; 2 ♀, Khao Luang, August 8, 23.

Whether this name can be properly used is questionable (see Deignan, Auk, 1942, p. 313). The two birds from Khao Luang are not typical of this form. They are somewhat yellower below, and slightly more olivaceous above.

The wings measure 79.5, 81, and the tails 66-69.5 mm. and thus are somewhat smaller than *brunnescens*. Perhaps they should be called *cinnamomeiventris*, Baker.

***Microscelis charlottae propinquus* (Oustalet)**

2 ♂, Wat Pa, October 10, 23; 2 ♂, ♀, Chanuman, January 9-17; 3 ♂, Kratt, November 27-December 9; ♀, Khao Sabab, June 22; 2 ♀, Khao Soi Dao, May 17, 22.

The wings of males measure 85, 86, 86, 92, tails 77, 79, 79, 79; the female, wing 85, tail 80.

A series of northern Siamese birds measure, 8 ♂, wings 86.5-90, tails 76-84; 5 ♀, wings (82), 84-90, tails 75-83 mm. Two males from Rayong have wings of 85, 89, and tails of 78-79 mm.

Specimens from Chantaboon, Kratt, Khao Sabab and Khao Soi Dao are smaller. Four males have wings of 81-85, tails 71-74 mm.; 4 ♀, wings 79-82, tails 67-68.5 mm.

Microscelis virescens malaccensis (Blyth)

4 ♂, ♀, Khao Bhanam Bencha, August 3-September 18.

A male is marked, "eyes light brown; beak dark gray; legs gray."

Microscelis madagascariensis stresemanni Mayr

♀, Chanuman, January 25.

The soft parts are recorded as, "eyes light brown; bill and feet red."

Microscelis madagascariensis leucocephalus (Gmelin)

4 ♂, 4 ♀, Chanuman, January 25-February 12.

TIMALIIDAE

Eupetes macrocercus macrocercus (Temminck)

♂, Waterfall, Trang, October 10.

The soft parts of this curious bird are marked, "eyes dark brown; beak black; legs dark gray."

Whether *griseiventris* Baker can be maintained I do not know, for we have no Sumatra material. The name has been discarded rather generally.

Deignan, referring to *Liocichla ripponi* (Oates), says: "this extraordinary species has been found in Thailand only by Smith who collected on Doi Langka, a male Nov. 30, 1930, and a female, April 26, 1931."

My men found it common on Doi Pha Hom Pok, for during the winter of 1938 they collected no less than 14 specimens. As Deignan does not give the colors of the soft parts, I here give them from my men's notes. "Eyes very light gray; beak dark gray; legs violet-gray."

Garrulax leucolophus diardi (Lesson)

♂, 2 ♀, Kemraj, January 4; 2 ♀, Wat Pa, October 12; ♂, ♀, Khao Soi Dao (3500 ft.), May 5, 18; ♀, Khao Sabab, June 18; ♂, ♀, Kratt, November 26.

The soft parts of a male from Khao Soi Dao are marked, "eyes light brown; beak black; feet gray." Deignan records the iris of a male and female from northern Siam as, "dark brown" (Bull. 186, U. S. Nat. Mus., 1945, p. 358).

Garrulax leucolophus belangeri Lesson

♂, Srisawat, July 2.

This bird stands out in a series of 38 specimens from northern, central and eastern Siam by its very dark rufous flanks and lower belly.

It agrees entirely with a pair collected by Hauxwell at Thoungyin, Burma.

The form has not previously been recorded from Siam.

Garrulax leucolophus peninsulae new subspecies

TYPE.—♂, ad., A.N.S.P., no. 130244, collected at Khao Luang (3400 ft.), Peninsular Siam, on August 20, 1937, by Lucas Bah.

Description.—Differs from *G. l. diardi* Lesson by having the long feathers which spring from the sides of the breast, and the flanks, pure white or only very slightly marked with hazel. Tibial feathers on the average much grayer. Under tail-coverts white, only slightly tinged with olive-brown.

Measurements of type.—Wing 136, tail 121, culmen 23 mm.

Range.—The mountains of southwestern Siam between 11° and 12° N.

Material examined.—*Garrulax leucolophus diardi*, 38 specimens from Keng Tung and Mong Lin, Southern Shan States; Chieng Sen, Chieng Mai, Tung Sio, Me Poon, Me Rampan, Wat Pa, Kemraj, Khao Soi Dao, Khao Sabab, Kratt, Nakon Nayok, Pak Chong, Sriracha, Ban Pong.

G. l. belangeri, 3 specimens from Srisawat and the Thaungyin river.

G. l. peninsulae, 5 specimens from Khao Luang (3400 ft.).

Remarks.—Five birds, all from Khao Luang stand out from 38 specimens from northern, central and eastern Siam by the whiteness of their underparts, and can be easily picked out from them if the two series are mixed together.

It is interesting to find that farther north in western Siam (Srisawat), *belangeri* with extensively and brightly colored flanks is found.

Deignan, at my request, very kindly examined the birds in the U. S. National Museum from Koh Lak and Pran, both localities on the coast of southwestern Siam, and found them inseparable from typical *diardi*. We must therefore conclude that *diardi* is replaced in the hills by *peninsulae*, just as *diardi* is replaced in the hills west of Raheng, which is in the lowlands, by *belangeri*. Deignan writes me that birds from those hills and Sai Yok on the western branch of the Me Klong river belong to that form.

The iris of a male from Khao Luang is noted as, "red," while both Deignan and I record northern birds as having brown irides.

Deignan has very kindly called my attention to Walden's *Garrulax leucogaster* described from "some part of Siam" (P. Z. S., London, pp. 548-549, 1866) as being possibly an earlier name for this form. It is compared to *belangeri* only, but the description of the bird fits *diardi* with which it was later synonymized by Walden (Ibis, 1867, pp. 381-382), without, however, his seeing *diardi*, of which he had no knowledge at the time *leucogaster* was described.

The description of the bird, ". . . entire under surface is white, the thigh-covers, and flanks only being rufous" is the manner in which *diardi* differs from *belangeri*.

In the Ibis, Walden seemed satisfied that Lesson's description of *diardi*, which he quotes, fitted his bird. Certainly this particular passage of Lesson's description fits *diardi* and not *peninsulae* "mais il me semble qu' elle peut parfaitement s' isoler des espèces connues de Garrulax par le blanc de la partie mediane de son abdomen." (The italics are mine.)

Peninsulae, as may be seen from the description, differs from *belangeri* by having the entire abdomen white, not just the median portion, as does *diardi*.

Hume (Stray Feathers, 9, 1880, pp. 292-3) records birds from the Tavoy-Siam frontier as *leucogaster*, but he also had not seen *diardi*.

Since the above was written I have heard from Dr. J. D. MacDonald, who most obligingly examined the type of *Garrulax leucogaster*, which is in the British Museum. He writes me as follows: "On the Tweedale label the locality given is Cambodia, which is more definite than the "some part of Siam" given in the P.Z.S. This specimen definitely belongs to the rufous group and, I would say, is a rather dirty and slightly "foxed" *G. l. diardi*, with rufous on the sides of the breast and flanks."

***Garrulax pectoralis meridionalis* Robinson and Kloss**

2 ♂, 2 ♀, Srisawat (all very worn), June 28-July 7; 3 ♂, ♀, Ban Thung Luang, January 11-22; ♂, Khao Nok Wua (2000 ft.), September 30; ♂, Khao Luang (3400 ft.), August 9.

The black pectoral band on birds from northern Siam averages wider and more solid than in birds from Srisawat southward, and the tips to the tail feathers are paler.

Pha Hom Pok birds are certainly *meridionalis* but a single specimen from Keng Tung, Southern Shan States just as certainly is not. The pectoral band is solid and wide; the rufous collar on the hind neck is brighter and deeper in color; the crown and back is darker, and the rufescent tinge on the rump more conspicuous. The rufescent tinge on the under surface is deeper, and the tips of the tail feathers more ochraceous, as in birds from southwestern Siam. In size it is slightly smaller.

This specimen perhaps belongs to *robini* Delacour, a form which has not been recorded, I believe, from Burma. We have no specimens from Chieng Sen or Chieng Rai, but birds from there may belong to this form.

***Garrulax monileger fuscatus* Baker**

♂, ♀, Ban Thung Luang, January 22, 26; 2 ♂, 3 ♀, Khao Luang, August 8-September 16.

The soft parts for a female from Khao Luang are marked, "eyes bright yellow; bill gray; legs grayish white."

I still hold that birds from northern Siam (*bakeri*) differ from those from southwestern Siam. They have a very much paler nuchal collar, and the dorsal surface is olivaceous instead of rufescent. The tail is olive-gray instead of olive-brown. The birds which I originally described from Chieng

Mai were taken in January, and the January examples from Ban Thung Luang are certainly comparable.

A specimen from Kyundaw (30 kilometers northwest of Seykpiu on the Irrawaddy at about 21° N.) rather resembles northern Siamese birds, but it is still paler and slightly more olivaceous. The pectoral collar is narrower, and the tips of the tail feathers pure white instead of whitish buff. The ear coverts are slaty, only whitish in the center, instead of white tipped with slaty. Northern Siamese birds are intermediate between this bird and specimens from southwestern Siam. The Kyundaw bird taken January 27, 1937, was left as an undetermined subspecies by Stresemann, who said his birds were very like five specimens from Maymyo (Mitteil. Zool. Mus., Berlin, 24, 2, p. 210, 1940).

***Garrulax monileger mouhoti* Sharpe**

♀, Wat Pa, October 13; ♂, ♀, Chanuman, January 20, 21; ♂, Khao Soi Dao (3500 ft.), May 7.

These birds differ from examples from southwestern Siam by darker tips to the tail feathers, more rufescent backs, and more deeply colored nuchal collar. The differences between the two is less than between birds from northern and southwestern Siam. At Keng Tung a deeply colored form appears again; this is *schauenseei* Delacour and Greenway, described from Xieng Khouang, Upper Laos. It is also recorded by Deignan from east of the Koon Tan range, in northeastern Siam.

***Pomatorhinus schisticeps fastidiosus* Hartert**

2 ♂, ♀, Khao Bhanam Bencha (3500 ft.), September 12-22; ♂, Langsuen, May 4.

"Iris yellowish brown; bill deep yellow; legs dull blue" (Langsuen).

***Pomatorhinus schisticeps olivaceus* Blyth**

♂, ♀, Srisawat, July 7, 10.

These two birds and two others from Ban Pong average smaller than the peninsular birds. In addition, the rufous collar on the hind neck averages less deep in color.

A series of 13 birds of this species from Pha Hom Pok, are intermediate between 14 birds from Doi Chieng Dao and Doi Soutep, and a single example of what I take to be *ripponi* from Keng Tung. Pha Hom Pok birds tend to have the sides of the breast duller, this color often not carried down onto the flanks. The Keng Tung bird has the sides of breast and flanks entirely devoid of chestnut, this being replaced by a buffy clay-color. Deignan, who has examined the type of *nuchalis* (and *ripponi*), says that that bird is a deeply colored race, restricted to the Sittang-Salween watershed and that north Siam birds are intermediate between it and *ripponi*. He, however, states that in color *ripponi* is not certainly separable from *olivaceus* but

my examples of the latter have the sides of the breast and flanks darker, more olivaceous, less clay-colored, than the Keng Tung bird. Further, the chestnut collar in the bird from the latter locality is paler. The bill, as Deignan says, is smaller. The male from Keng Tung has a bill of 18.5 mm., vs. 22-26 for *olivaceus* from Ban Pong and Srisawat.

The form which I cannot separate from *olivaceus* is *humilis* Delacour. A single example from Bolovens Plateau (type locality) agrees absolutely in color with my specimens of *olivaceus*, having dark olivaceous sides to the body, dark chestnut sides to the neck, and a bill of 23 mm.

***Pomatorhinus schisticeps klossi* Baker**

7 ♂, 5 ♀, Khao Soi Dao (3500 ft.), May 6-31; 4 ♂, 3 ♀, Kratt, November 11-December 9; 2 ♂, ♀, Khao Sabab (3000 ft.), June 11-20; ♂, Rayong, October 21.

The male from Rayong has a wing of 102 and a tail of 112 mm. Eleven males from the other localities have wings of 90, 96, 97 (2), 98 (4), 99, 101 (2), tails 96 (2), 98 (2), 101.5, 102 (2), 103 (2), 104 (2), 106 mm.

Pomatorhinus erythrogenys celatus Deignan, hitherto known only from Doi Chiang Dao is common on Doi Pha Hom Pok from whence we have a series. A juvenile from Keng Tung probably belongs to this form.

***Pomatorhinus hypoleucos tickelli* Hume**

♀, Srisawat, July 13; 3 ♂, 4 ♀, Wat Pa, October 13-November 14; ♀, Kratt, December 2; ♂, Ban Thung Luang, January 10; 2 ♂, 4 ♀, Khao Luang (3400 ft.), August 20-25; 4 ♂, 2 ♀, Khao Nok Wua (2000 ft.), September 21-October 19.

I can detect no differences in birds from various parts of Siam.

***Timalia pileata intermedia* Kinnear**

♀, Khao Nok Wua (2000 ft.), October 21.

Not previously recorded from peninsular Siam.

***Timalia pileata dictator* Kinnear**

♂, 2 ♀, Chanuman, January 15,

These birds differ from specimens from other parts of Siam by having the upper surface warmer in tone, and darker.

Although these birds hardly agree with Kinnear's description of this form, I have placed them under it, having no Indo-China material for comparison. These three birds are in exceptionally fresh plumage; the type was collected May 11, therefore probably worn.

***Pellorneum ruficeps subochraceum* Swinhoe**

2 ♂, ♀, Srisawat, July 10-14; 5 ♂, 3 ♀, Ban Thung Luang, January 11-19; ♂, ♀, Keng Sok, March 10; ♂, Pran, March 17; ♀, Khao Nok

Wua (2000 ft.), September 27; 4 ♂, 3 ♀, Khao Luang, August 23-September 14; 2 ♂, Khao Bhanam Bencha, September 22; ♂, Waterfall, Trang, October 4.

Five specimens from Nakon Sritamarat, Bagnara and Tamuang are also in the Academy's collection.

***Pellorneum ruficeps vividum* La Touche**

8 ♂, 2 ♀, Wat Pa, October 25-November 7.

These birds, including a male from Chieng Sen, and another from Me Poon, differs from *subochraceum* by having the spots on the lower surface blacker and larger, the ground color much whiter, less tinged with ochraceous. Chieng Mai birds are intermediate between this race and *subochraceum*. In nine specimens from Chieng Mai three are quite typical of the latter form.

***Pellorneum ruficeps smithi* Riley**

2 ♂, 4 ♀, Chanuman, January 28-February 3; 2 ♂, 2 ♀, Kemraj, January 3-5; ♂, 3 ♀, Khao Soi Dao (3500 ft.), May 8-26; ♂, Khao Sabab (3000 ft.), June 15; 2 ♂, ♀, Kratt, November 28-December 3.

This series averages much more heavily spotted below, and has the flanks much darker than birds from Wat Pa and Chieng Sen. In addition to the birds listed above we have two males and a female from Chantaboon, and a single male from Bua Yai, the latter agreeing best with this race.

Only large series show these differences.

***Pellorneum capistratum nigrocapitatum* (Eyton)**

7 ♂, ♀, Khao Bhanam Bencha (3500 ft.), August 13-September 10; ♀, Waterfall, Trang, October 1.

***Malacocincla abbotti abbotti* Blyth**

5 ♂, 3 ♀, Khao Soi Dao (3500 ft.), May 8-30; 3 ♂, Khao Sabab (3000 ft.), June 11-24; 8 ♂, 2 ♀, Kratt, November 29-December 10; 2 ♂, Keng Sok, March 9, 12; 3 ♂, ♀, Ban Thung Luang, January 10-19; 5 ♂, ♀, Khao Luang (3400 ft.), August 5-September 14; 4 ♂, ♀, Khao Nok Wua (3000 ft.), September 8-October 22; 4 ♂, 2 ♀, Khao Bhanam Bencha (2000 ft.), August 10-September 15.

The soft parts of a female from Khao Luang are marked, "eyes light brown; bill, upper gray, lower blue-gray; legs, fleshy gray." A male from the same locality is marked as having had the "eyes light chestnut; bill blue-gray; legs flesh."

***Aethostoma rostratum rostratum* (Blyth)**

♂, Khao Bhanam Bencha, August 5.

***Anuropsis malaccensis malaccensis* (Hartlaub)**

6 ♂, 3 ♀, Khao Bhanam Bencha (2000-3500 ft.), August 7-September 1.

Although Chasen includes Sumatra in the range of this form, a single female from Meloewak has the upper surface, particularly the crown, very much darker than in Siamese examples.

Malacopteron magnum magnum Eyton

♂, Khao Bhanam Benchha, August 3.

The soft parts are recorded as, "eyes reddish brown; bill dark gray; legs light gray."

Malacopteron cinereum cinereum Eyton

3 ♂, ♀, Khao Bhanam Benchha, August 8-September 20.

Malacopteron magnirostre magnirostre (Moore)

3 ♂, ♀, Khao Luang (3400 ft.), August 7; 8 ♂, Khao Bhanam Benchha, August 7-September 22; ♀, Waterfall, Trang, October 6.

A male from Khao Luang is marked, "eyes light brown; bill, upper light gray, lower, blue gray with yellow [? near base]; legs fleshy gray."

Turdinus macrodactylus bakeri Hachisuka

♂, Khao Bhanam Benchha, September 10.

Although Riley did not recognize this form, Chasen says it differs from Malacca birds by being very slightly grayer below. We have no comparative material.

Napothera exsul granti (Richmond)

♀, Khao Bhanam Benchha, August 25.

Alcippe poiocephala eremita Riley

2 ♂, Kratt, December 8.

I have no specimens of *peracensis* Sharpe for comparison, but it seems reasonable to suppose that birds from southeastern Siam are different. Delacour, however, records *peracensis* from Lower Laos and southern Annam (L'Ois., 1940, p. 182).

Knowing that the type of this bird is in Washington I wrote Deignan about the two examples here recorded. He writes me of Riley's race as follows, "This bird of course is not *peracensis* just as you have guessed. The fact is that it is a race of *poiocephala* and has no connection with the other species. Riley placed it in the wrong group and for that reason no one has accepted it."

Alcippe brunneicauda (Salvadori)

♂, Khao Bhanam Benchha (3500 ft.), August 13, 1936.

Alcippe rufogularis khmerensis (de Schauensee)

2 ♂, ♀, ♀ juv., Khao Soi Dao (3500 ft.), May 25-26; ♂, Khao Sabab (3000 ft.), June 23; 3 ♂, ♀, Kratt, November 29-December 3.

The soft parts of a male from Khao Soi Dao are recorded as, "eyes light brown; beak dark gray; legs light yellow."

The juvenile female differs from the adult in having the crown only slightly more rufescent than the back, and without the black streaks on the side. The gular band is but slightly indicated. The breast is brown, the flanks and under tail-coverts rufescent, the center of the abdomen white.

***Stachyris maculata pectoralis* (Blyth)**

7 ♂, ♀, Khao Bhanam Bencha (3500 ft.), August 11-September 14.

A male has the soft parts recorded as, "eyes yellowish white; beak, upper dark gray, lower flesh color; legs gray-blue."

***Stachyris nigriceps davisoni* Sharpe**

♀, Khao Bhanam Bencha, September 20.

***Stachyris poliocephala poliocephala* (Temminck)**

3 ♀, Khao Bhanam Bencha (3500 ft.), August 10-September 1.

***Stachyris nigricollis erythronotus* (Blyth)**

3 ♂, Khao Bhanam Bencha (3500 ft.), August 25-September 20.

***Kenopia striata* (Blyth)**

♂, 3 ♀, Khao Bhanam Bencha (3500 ft.), August 20-28.

***Cyanoderma erythroptera erythroptera* (Blyth)**

3 ♂, 3 ♀, Khao Bhanam Bencha (2000 ft.), August 4-September 18; ♀, Waterfall, Trang, October 2; ♂, Nong Tao, January 6.

An immature bird has the flanks and belly buffier than in adults.

The soft parts of a male are recorded as, "eyes reddish brown; legs gray; beak light gray."

***Mixornis gularis connectens* Kloss**

3 ♂, ♀, Khao Bhanam Bencha, August 2-September 18; ♂, Waterfall, Trang, October 9.

***Mixornis gularis inveterata* Oberholser**

2 ♂, ♀, Kratt, November 20-December 12.

In addition to the above specimens we also have three males and one, sex not determined, from Sriracha, and a female from Chantaboon.

In his review of the races of *Mixornis gularis* Delacour (L'Ois., 1936, pp. 1-27) called all birds from southern Siam, Cambodge, Cochin-Chine and central and southern Annam *connectens*, described by Kloss from the isthmus of Kra.

The range of this form is, however, cut off from more eastern birds by a race with finely streaked throat which is very different from *connectens*.

These birds from southern and eastern Siam, east of the Me Nam Chao Phya, differ from *connectens* by having the throat and breast not quite so heavily streaked with black, in having the rufous cap paler and brighter, the eyebrows broader and of a clearer yellow.

Oberholser's *inveterata* was described from Koh Kut, an island a few miles off shore, just south of Kratt, and although I have not seen birds from there I doubt very much if they differ from mainland examples.

Mixornis gularis lutescens Delacour

3 ♂, 7 ♀, 2 o, Chanuman, January 16-February 7; ♂, Kemraj, January 1; ♂, Khulu, December 23.

Mixornis gularis sulphurea (Rippon)

5 ♂, 2 ♀, Wat Pa, October 24-November 1.

These birds are distinctly paler above, with paler caps, than birds from the Me Kong drainage.

Mixornis gularis deignani new subspecies

TYPE.—A.N.S.P. no. 130238, collected at Khao Luang (3400 ft.), southwestern Siam, on September 14, 1937, by Lucas Bah.

Description.—Above like *connectens*, but much less heavily streaked below. Differs from *M. g. sulphurea* (Rippon) by darker cap and upper surface. Streaking below, on the average, very slightly heavier, but not visibly different except in series. Differs from *lutescens* by having the cap paler and the dorsal surface distinctly darker.

Measurements of type.—Wing 56.5, tail 50, culmen 12 mm.

Range.—From Khao Luang northward in western Siam to the Gorges of the Me Ping.

Remarks.—This form cuts off the range of *inveterata* from that of *connectens*. The former appears to occur only to the east of the Me Nam Chao Phya, while *deignani* occurs only in western Siam. Kloss (Journ. of the Nat. Hist. Soc. Siam, V, p. 301, 1924) noticed the lighter streaking below of the birds from Koh Lak and Hat Sanuk.

Deignan (Bull. 186, U. S. Nat. Mus., p. 388, 1945) remarks on the slightly heavier streaking of the lower parts and more chestnut-rufous crowns in birds from south of the Gorges of the Me Ping.

As this population seems constant in its characters over a wide area in western Siam, it appears best to differentiate it. In all, 16 specimens of this form have been seen. They will be found listed under material examined. A total of 89 specimens of the various forms have been seen.

Named in honor of my friend H. G. Deignan, of Washington, D. C.

Material examined.—In addition to the specimens listed under the various races of *Mixornis gularis* given above, I have also seen the following specimens:

M. g. gularis, 7 o, Gunong Sugi; ♀, Koengke; 3 ♂, Koetatjane; ♂, Mel-oewak, Sumatra.

M. g. inveterata, 3 ♂, 0, Sriracha; ♀, Chantaboon.

M. g. deignani, 3 ♂, 2 ♀, Khao Luang; ♂, Khao Nok Wua; 3 ♂, Keng Sok; 2 ♂, ♀, Ban Thung Luang; ♂, ♀, Ban Pong; ♂, ♀, Srisawat (these two are paler above, but they are summer specimens and considerably worn).

M. g. sulphurea, ♂, Chieng Dao; ♂, 2 ♀, Chieng Mai.

M. g. lutescens, 3 ♂, Chieng Rai; 2 ♀, 0, Chieng Sen; ♂, ♀, French bank of the Me Kong opposite Chieng Sen; 4 ♂, Mong Lin, Southern Shan States; ♂, ♀, Sop Lao, Southern Shan States; ♂, Nam Kam, Laos.

M. g. ticehursti, 3 ♂, 2 ♀, Dudaw Taung, Pakokku, Chinn Hills, Burma. The forms found in Siam, and their ranges in that country are as follows:

Mixornis gularis sulphurea, northern Siam, south to the Gorges of the Me Ping on the west, and Wat Pa on the east, excepting the region of the Mekong watershed.

Mixornis g. deignani, western Siam from the Gorges of the Me Ping south at least to Khao Nok Wua.

Mixornis g. connectens, from the isthmus of Kra southward.

Mixornis g. lutescens, from northeastern Siam southward in the Me Kong drainage to at least Khulu.

Mixornis g. inveterata, southern Siam from the Me Nam Chao Phya to the Cambodian border, and northward to Khao Soi Dao.

***Erpornis zantholeuca interposita* Hartert**

5 ♂, 5 ♀, Khao Luang (3400 ft.), August 16-September 16; ♂, ♀, Khao Nok Wua (2000 ft.), September 22, 25; ♂, ♀, Ban Thung Luang, January 17, 18; 2 ♂, ♀, Srisawat, July 10-13; ♂, Keng Sok, March 10.

A female from Khao Luang is marked as having the "eyes light gray; bill light gray; legs flesh color."

***Erpornis zantholeuca canescens* Delacour and Jabouille**

♂, Khao Sabab, January 24; 2 ♂, Rayong, October 13, 22; 2 ♂, ♀, Kratt, December 8-9.

***Erpornis zantholeuca sordida* Robinson and Kloss**

4 ♂, Chanuman, January 7-February 12.

These birds are greener above, with less of a grayish cast particularly on the crown, than birds from Kratt.

From north Siam examples they differ by being darker above, and grayer below. *Interposita* in turn is yellower above.

I do not believe this form has been recorded from Siam before.

TURDIDAE

Enicurus schistaceus Hodgson

♀, imm., Khao Luang (3400 ft.), August 8.

So far as I am aware this species has not been taken in Siam except in the north. Robinson and Kloss record it, however, from Perak, and the Selangor-Pahang boundary (Jour. Siam Nat. Hist. Soc., 5, p. 310).

Enicurus leschenaulti frontalis Blyth

2 ♂, ♀, ♀ imm., Khao Bhanam Bencha (2000 ft.), August 7-September 22.

The immature female is blackish brown above with the white frontal patch just appearing. The throat is white, the chest blackish brown, the feathers with white shaft streaks.

Enicurus ruficapillus Temminck

♂, Khao Bhanam Bencha (3500 ft.), August 25.

Myophonus caeruleus crassirostris Robinson

♀ Khao Luang, September 4.

The soft parts are recorded as, "eyes light brown; beak deep yellow; legs black." The plumage is very much worn, and the bird is in heavy moult.

Compared to a series of *eugenei* from northern Siam this specimen is more purplish in general coloration, and the bill all yellow except for the ridge of the culmen. The bill is also noticeably thicker.

Curiously, however, it has no white bases to the feathers of the flanks or lower back, nor does it have white-tipped wing-coverts, as it should to belong to *crassirostris* although the latter character does not appear to be constant. As the bill measures 13 mm. in depth, I have recorded it as above, but am not sure I am correct in doing so. It could hardly be *eugenei*, however, for Khao Luang is far to the south of the known range of that bird.

Saxicola caprata burmanica Baker

♂, Wat Pa, October 9.

Deignan (Bull. 186, U. S. Nat. Mus., 1945, p. 412) has shown this to be a recognizable race, the characters being apparent in females.

Saxicola torquata stejnegeri (Parrot)

2 ♂, Wat Pa, October 8, 10; ♀, Khulu, December 25, ♂, Petriu, January 16.

The wings measure as follows: ♂, 68, 68, 69, ♀, 67.5 mm.

Luscinia cyane (Pallas)

3 ♂, 2 ♀, Ban Thung Luang, January 10-24; ♂, ♀, Khao Nok Wua (2000 ft.), September 30-October 2.

Luscinia svecica weigoldi Kleinschmidt

♂, Hua Mak, March 17; ♂, Khulu, December 18.

The soft parts are recorded thus, "eyes light brown; beak black; legs gray."

Copsychus saularis musicus (Raffles)

♂, Khao Luang (3400 ft.), September 8.

The taking of only one specimen of *Copsychus* is probably due to the fact that it is so common and familiar that my boys thought it hardly worth collecting.

Kittacincla malabarica interposita Robinson and Kloss

4 ♂, Wat Pa, October 10-November 7; ♂, 3 ♀, Chanuman, January 14-February 5; ♀, Khulu, December 21; 4 ♂, ♀ juv., Khao Soi Dao, May 10-16; ♂, Kratt, November 26; 3 ♂, ♀, Srisawat, July 2; 4 ♂, Ban Pong, March 4-6; ♂, Keng Sok, March 6; ♂, ♀, Ban Thung Luang, January 11, 14; 3 ♂, 2 ♂ imm., Khao Luang (3400 ft.), August 6-September 16; 3 ♂, Khao Nok Wua (2000 ft.), September 30-October 3.

Kittacincla malabarica mallopercna Oberholser

♂, Waterfall, Trang, October 7; 3 ♂, 3 ♀ juv., Khao Bhanam Bencha (3500 ft.), August 14-September 15.

Monticola gularis (Swinhoe)

15 ♂, 8 ♀, Chanuman, January 18-February 9.

Very rare in other parts of Siam, this small rock thrush appears to winter abundantly in the Me Kong valley.

One male, has the flanks barred with black, apparently the remains of immature plumage.

The soft parts of an adult male are recorded as, "eyes light brown; beak dark gray; legs grayish white."

The intensity of the chestnut-rufous color of the underparts in males varies considerably in depth in this series. In females the ground color of the underparts varies from pure white to dark buff.

Monticola solitarius pandoo (Sykes)

♂, Wat Pa, October 10; ♂, Chanuman, January 30; ♂, Kratt, December 8.

The Chanuman male has a very slight amount of chestnut on the under tail-coverts.

Monticola solitarius philippensis (Müller)

4 ♂, 2 ♀, Kemraj, January 1-5; ♂, ♀, Khulu, December 25, 27.

In this region a mixed population seems to winter. The male from Khulu is pure *philippensis* while the others actually are *philippensis* × *pandoo*.

Some have considerable rufous on the belly while others have only chestnut under tail-coverts and under wing-coverts.

Turdus obscurus Gmelin

♂, Ban Thung Luang, January 17.

Geokichla citrina citrina (Latham)

2 ♀, Ban Thung Luang, January 15, 25; ♂, Kapang, January 4.

All three birds have well developed white spots on the wing coverts.

MUSCICAPIDAE

Muscicapa sibirica sibirica Gmelin

♀, Khao Soi Dao (3500 ft.), May 1.

"Eyes dark brown; beak and legs gray." The wing measures 79.5 mm.

Muscicapa ?muttui Layard

♂, Khao Bhanam Bencha, August 3.

I have been unable to match this bird with anything in our collection. I sent it to Deignan, who kindly agreed to try and identify it, but he found that it agreed with nothing in the U. S. National Museum. He suggests that it might be a specimen of *muttui* in first year plumage or even an erythristic *latirostris*. The bill, however, is slightly narrower than in a large series of the latter.

The specimen is moulting the primaries and rectrices.

Muscicapa latirostris latirostris Raffles

♂, Chanuman, January 13; ♂, Kemraj, January 1; ♂, Khulu, December 18; ♀, Wat Pa, October 21; ♂, ♀, Kratt, November 27, December 5; ♀, Rayong, October 14; ♂ imm., Khao Luang (3400 ft.), August 10; ♂, ♀, Khao Nok Wua (2000 ft.), October 11, 14; ♀, Waterfall, Trang, January 10.

Siphia parva albicilla (Pallas)

♂, ♀, Wat Pa, October 7, 30; ♂, ♀, Chanuman, January 19, February 4; ♂, ♀, Khulu, December 19, 23; ♀, Kemraj, January 4.

Siphia mugimaki (Temminck)

♂, Kratt, December 5.

An uncommon migrant in Siam, from which country there are few records.

Siphia narcissina xanthopygia (Hay)

2 ♂, Pran, March 19; ♂, Khao Luang (3400 ft.), August 28.

Cyornis hainana (Ogilvie-Grant)

3 ♂, 2 ♀, Wat Pa, October 10-November 4; 2 ♂, ♂ juv., ♀, Srisawat, June 30-July 11; ♂, Kemraj, January 5; 2 ♂, ♀, Chanuman, January 21-February 7; ♂ imm., 3 ♀, Kratt, November 28-December 7; 2 ♀, Ban Thung Luang, January 18, 22.

Cyornis banyumas deignani de Schauensee

♂ (type), 2 ♂, Khao Soi Dao (3500 ft.), May 30; ♂, Chantaboon, March 28; ♂, ♀, Kratt, December 2, 5.

Cyornis banyumas caerulifrons Baker

5 ♂, ♂ imm. ♀, imm., Khao Bhanam Bencha (3500 ft.), August 23-September 12.

In this series, ♂ no. 127953 was compared by Dr. Ticehurst with the type of *caerulifrons* with which it was found to agree.

Deignani differs principally by having the orange-rufous of the chest continued down the flanks, instead of these parts being white.

Cyornis tickelliae indochina Chasen and Kloss

9 ♂, 6 ♀, Chanuman, January 7-February 9.

When Stresemann and I wrote a review of *Cyornis* in 1936 we did not have these specimens from the west bank of the Me Kong.

The females are distinctly less bluish above than *sumatrensis* from farther west, and the males are a trifle paler blue above. Birds from here must be referred to *indochina* in spite of our assertion that that form occurred only to the east of the Me Kong.

Cyornis tickelliae sumatrensis (Sharpe)

♂, Wat Pa, October 25; 3 ♂, ♀, Srisawat, June 20-July 12; 3 ♂, Ban Pong, March 5-8; 2 ♂, Pran, March 17, 19; 4 ♂, 2 ♀, Ban Thung Luang, January 10-26; 2 ♂, 2 ♀, Khao Nok Wua (2000 ft.), September 22-October 4; 6 ♂, 4 ♀, Khao Luang, August 9-September 14.

Cyornis rubeculoides glaucicomans Thayer and Bangs

♂, 2 ♀, Wat Pa, October 30-November 5; ♂, Keng Sok, March 5; 3 ♀, Ban Thung Luang, January 18, 19; ♀, Khao Nok Wua, September 29.

Rhinomyias olivacea olivacea (Hume)

♂, Khao Bhanam Bencha (3500 ft.), August 15.

Eumyias thalassina thalassoides (Cabanis)

♀, Waterfall, Trang, October 7; ♂, 2 ♀, Khao Bhanam Bencha (3500 ft.), August 4-September 6.

The male, taken on August fourth, has the remains of immature plumage on its lower surface.

Eumyias thalassina thalassina (Swainson)

2 ♂, ♀, Ban Thung Luang, January 10-21; ♂, Khulu, December 22; ♂, Kemraj, January 3; 4 ♂, 2 ♀, Chanuman, January 13-February 26; ♂, 4 ♀, Kratt, December 1-9.

All these birds agree with a large series from Pha Hom Pok and other northern Siamese localities. In males the blue shade is rather variable,

some, irrespective of locality, having the plumage bluer, less green-blue than others.

Culicicapa ceylonensis *pernocara* Oberholser

3 ♂, 2 ♀, Wat Pa, October 11-November 3; 2 ♂, 2 ♀, o, Khulu, December 18-22; 2 ♂, Kemraj, January 4, 5; ♂, Chanuman, January 23; ♂, Khao Bhanam Bencha (3500 ft.), August 20.

I should like to remark here that a single male of *Chelidorhynch hypoxantha* (Blyth) from Chieng Dao, had the upper surface darker, the lores and ear-coverts blacker, the under surface a trifle deeper yellow, than in birds from farther north. It is also smaller. It measures wing 50, tail 49.5. Other birds in our collection measure as follows: o, Hoa-ni-pu (west of Tali), Yunnan, wing 55, tail 53; Mt. Victoria, 3 ♂, wing 54, 55, 55.5, tail 55, 56, 58, 2 ♀, wing 52.5, 53, tail 56, 58; Kyu Loi, Southern Shan States ♂, wing 53.5, tail 55, 2 ♀, 52.5, 55, tail 53, 55 mm.

In 1934 (Proc. A.N.S.P. 86, p. 220) I recorded two males from Chieng Dao. This was an error, as there is only one from there, the other male being from Kyu Loi.

Rhipidura aureola burmanica (Hume)

♀, Srisawat, June 30 (very worn).

Rhipidura javanica longicauda Wallace

♂, Khao Luang, September 3; ♂, Khao Bhanam Bencha, September 12.

Hypothymis azurea styani (Hartlaub)

2 ♂, 2 ♀, Wat Pa, October 11-30; 4 ♂, Srisawat, July 12-14; 2 ♂, 2 ♀, Khulu, December 21-27; 3 ♂, 2 ♀, Chanuman, January 11-18; ♂, 2 ♀, Khao Soi Dao (3500 ft.), May 25-June 14; 2 ♂, ♀, Kratt, November 27-29; ♂, ♀, Khao Luang (3400 ft.), August 10, September 5; 2 ♂, ♀, Khao Bhanam Bencha (3500 ft.), August 5-23; ♀, Kapang, January 4.

All these birds agree well together.

Philentoma velata caesia (Lesson)

♀, Khao Luang (3400 ft.), August 6; 2 ♂, 4 ♀, Khao Bhanam Bencha (3500 ft.), August 7-September 14.

The soft parts of a male are recorded as "eyes reddish; beak and legs black."

Khao Luang must represent the northern limit of the range of this species.

Philentoma pyrrhoptera pyrrhoptera (Temminck)

2 ♂, 7 ♀, Khao Bhanam Bencha (3500 ft.), August 17-September 15; ♀, Kapang, January 2.

The soft parts for a male are marked, "eyes red; beak black; legs blue-gray."

***Tersiphone paradisi indochinensis* (Salomonsen)**

6 ♂, Wat Pa, October 8-25; ♂, Kemraj, January 3; ♂, Kratt, December 1; ♂, ♀, Ban Thung Luang, January 21; 3 ♂, ♀, Khao Nok Wua (2000 ft.), September 23–October 4; Khao Bhanam Benchha (2000 ft.), August 7; ♂, ♀, Nong Tao, January 7.

The only males in white plumage are two from Khao Nok Wua and one from Nong Tao. One from the former locality has the lengthened tail feathers, the other two do not.

***Tersiphone paradisi ineci* (Gould)**

♂, Wat Pa, October 10; ♂, 5 ♀, Khao Luang (2000-3400 ft.), August 26–September 15; 2 ♂, 4 ♀, Khao Nok Wua (2000 ft.), September 22–October 9; ♂, Khao Bhanam Benchha, September 20.

***Pachycephala cinerea cinerea* (Blyth)**

♀, Khao Luang, September 5.

Ripley (Bull. Mus. Comp. Zool., XCIV, 1944, p. 401) considers both *butaloides* Stresemann and *nesiotis* Oberh., as synonyms of *vandepolli* Finsch. In our Siamese material a pair from Koh Tao agree with the type of *vandepolli* and a pair from Nias. The Khao Luang bird and two males from Tamuang are paler above, and slightly so on the chest, so I have referred them to *cinerea* although I have seen no typical specimens.

The two Tamuang males have wings of 78 and 80, the female from Khao Luang 79 mm. The type of *vandepolli* (♂) measures 88, the pair from Nias ♂ 82, ♀ 78 (worn) the male from Kho Tao 80, the female 82 mm.

SYLVIIDAE***Scicercus burkei distinctus* (La Touche)**

♀, Wat Pa, October 24.

Unfortunately this specimen is so badly shot about the head that the pureness of the gray cannot be discerned. Because its back is a golden olive, I have identified it as above.

***Abroscopus superciliaris superciliaris* (Blyth)**

2 ♂, 3 ♀, Srisawat, June 30–July 14; 2 ♂, 2 ♀, Wat Pa, October 11–29.

Birds from Wat Pa average a trifle larger than those from Srisawat; when allowance is made for the difference in season the colors are very much the same.

***Abroscopus superciliaris schwaneri* (Blyth)**

2 ♂, Khao Bhanam Benchha, August 5.

This bird, in having the crown darker than birds from farther north, agrees with four examples of *schwaneri* from Sumatra. In size they are the same.

***Phylloscopus fuscatus fuscatus* (Blyth)**

♂, Chanuman, January 16.

***Phylloscopus schwartzi* (Radde)**

3 ♂, Wat Pa, October 26-November 4; ♂, ♀, Khulu, December 21, 25; ♂, Kemraj, January 5; 3 ♂, 5 ♀, Chanuman, January 5-February 8.

***Phylloscopus inornatus inornatus* (Blyth)**

4 ♂, 2 ♀, Wat Pa, November 4-7; ♂, Khulu, December 24; ♂, Kemraj, December 29; 4 ♂, ♀, Chanuman, January 17-February 10; ♂, Ban Thung Luang, January 20.

***Phylloscopus borealis borealis* (Blasius)**

♂, ♀, Wat Pa, October 5-14; 2 ♂, Khao Nok Wua (2000 ft.), September 23, 24; ♀, Waterfall, Trang, October 10.

***Phylloscopus trochiloides plumbeitarsus* Swinhoe**

♀, Chanuman, January 16.

***Phylloscopus tenellipes* Swinhoe**

♂, Wat Pa, October 29; ♀, Keng Sok, March 5; ♀, Khao Nok Wua (2000 ft.), October 5; ♂, Ban Thung Luang, January 17.

***Phylloscopus coronatus coronatus* (Temminck and Schlegel)**

2 ♂, Wat Pa, October 5, 14; ♂, ♀, Khao Luang (3400 ft.), August 27, September 14; ♀, Khao Nok Wua (2000 ft.), September 22.

***Phylloscopus ricketti ricketti* (Slater)**

2 ♂, 2 ♀, Wat Pa, October 31-November 6.

This is the southernmost record for this species. The only other Siamese records are a female from Doi Suthep and a male from Chiang Dao taken by Deignan.

Two specimens in the Academy's collection come from far to the north of the recorded range of this species, according to the range given by Ticehurst. They are from Hoang-ni-pu (♂ imm., August 11; ad., sex not determined, August 10) near Yachow in Szechwan.

The adult differs from my Siamese birds in having the yellow coronal bands duller, the black ones tinged with green. The yellow of the lower surface is similar. Surprisingly the wing of the adult measures only 50 mm., which is below the minimum given by Ticehurst for females. The immature male has a wing of 54 mm.

***Phragmaticola aëdon rufescens* Stegmann**

♂, 2 ♀, Kemraj; December 29-January 2; 5 ♂, ♀, Chanuman, January 14-February 7; ♂, ♀, Keng Sok, March 7, 10; 2 ♀, Ban Thung Luang, January 23, 24.

All the above birds have wings of 77 mm. or less, with the exception of a male from Chanuman (wing 79.5), and a female from Ban Thung Luang (wing 81). Whether these two should be recorded as belonging to the typical form I do not know for we have no birds from their breeding grounds. In color the largest of the two is indistinguishable from the others, and in fact belongs at the more rufescent end of the series. I have followed Chasen and Deignan in referring Siamese birds to *rufescens*.

***Orthotomus sericeus hesperius* Oberholser**

♂, ♀, Khao Bhanam Bencha (3500 ft.), August 14, 20.

The female differs from the male in having considerable black in the tail, instead of solid rufous as in the male.

***Orthotomus atrogularis nitidus* Hume**

2 ♂, Keng Sok, March 6, 8; ♂, Ban Thung Luang, January 24; ♂, Khao Luang, September 5.

***Orthotomus sutorius maculicollis* Moore**

♂, imm., Khao Bhanam Bencha (3500 ft.), August 14; ♂, imm., Srisawat, June 30; ♂, Kemraj, December 31.

***Prinia rufescens rufescens* Blyth**

♂, Srisawat, July 12; ♂, Chanuman, February 8.

***Prinia criniger cooki* Harington**

♂, Chanuman, February 13.

"Eyes light brown; beak light gray; legs flesh color."

MOTACILLIDAE

***Motacilla alba leucopsis* Gould**

2 ♂, ♀, Kemraj, December 27-31.

***Motacilla alba baicalensis* Swinhoe**

♂, Khulu, December 27; ♀, Kemraj, December 31.

***Motacilla alba ocularis* Swinhoe**

♂, Wat Pa, October 4; ♀, Khulu, December 27.

***Motacilla cinerea melanope* Pallas**

2 ♂, ♀, Wat Pa, October 9-November 1; ♀, Chanuman, December 1; 2 ♀, Khao Luang (3400 ft.), August 26.

***Dendronanthus indicus* (Gmelin)**

♀, Khulu, December 27; ♂, Chanuman, February 5; 2 ♂, Kratt, November 26, January 30; ♀, Khao Luang (3400 ft.), August 12; ♂, ♀, Khao Bhanam Bencha (3500 ft.), August 27.

August 12 is the earliest recorded date for this species in Siam. Deignan records May 2 as the latest spring date but we have a specimen from Bangkok collected by Y. Siah, usually very reliable as to data, marked June 8.

Anthus richardi rufulus Vieillot

♀, Rayong, October 17.

The wing of this specimen measures 76.5 mm.

Anthus richardi sinensis (Bonaparte)

♀, Chanuman, February 1, (wing 88 mm.).

ARTAMIDAE

Artamus fuscus Vieillot

♂, Khulu, December 17; ♂, Khao Luang (3400 ft.), September 16.

LANIIDAE

Lanius schach schomburgki Kinnear

2 ♂, ♀, Wat Pa, October 3-5.

These birds are typical of the central Siamese race (= *Lanius nigriceps longicaudatus* auct.).

Lanius collurioides collurioides Lesson

♂, Khulu, December 12; ♂, Chanuman, February 13.

Lanius cristatus cristatus Linnaeus

♂, 2 ♀, Wat Pa, October 6-November 8; 2 ♂, Chanuman, January 21, 30; 3 ♀, Khulu, December 12-19.

Lanius tigrinus Drapiez

2 ♂, Khao Luang (3400 ft.), August 27, 30; 2 ♀, Khao Bhanam Bencha, September 9, 10.

STURNIDAE

Gracula religiosa religiosa Linnaeus

2 ♂, Khao Bhanam Bencha, September 14.

Gracula religiosa intermedia Hay

2 ♀, Srisawat, June 29 (very worn); ♀, Wat Pa, October 22; ♂, o, Khulu, December 21; ♀, Kratt, November 27.

Acridotheres tristis tristis (Linnaeus)

♂, Khao Nok Wua (2000 ft.), October 15.

Sturnia malabarica nemoricola (Jerdon)

6 ♂, ♀, Chanuman, January 25-28.

Sturnia sturnia (Pallas)

4 ♂, ♀, o, Rayong, October 18-20; ♂, ♀, Waterfall, Trang, October 2, 3.

Sturnus buffonius (Shaw)

3 ♂, ♀, Khao Nok Wua (2000 ft.), October 21.

Sturnus contra floweri (Sharpe)

♂, Khao Soi Dao (3500 ft.), June 7.

"Eyes light yellow; beak and legs ivory."

Sturnus leucocephalus (Giglioli and Salvadori)

♂, Wat Pa, October 7; ♀, Khao Luang (3400 ft.), October 7; 4 ♂, Khao Nok Wua (2000 ft.), October 16-19.

The soft parts of a female from Khao Luang are recorded as, "eyes egg color; bill and legs orange color."

The birds from Khao Nok Wua were taken at the southern extremity of the range of this species.

Sturnus nigricollis (Paykull)

♂, ♀, Srisawat, July 5 (very worn); ♀, Chanuman, January 23.

Aplonis panayensis strigatus (Horsfield)

♂, 2 ♀, Khao Bhanam Bencha (3500 ft.), August 28-September 8; ♀, Kapang, January 13.

NECTARINIIDAE

Anthreptes simplex frontalis (Blyth)

♂, Khao Luang, August 17; ♂, Khao Bhanam Bencha, August 4.

Both these birds are greenish yellow below, rather than gray as in Sumatra birds.

The soft parts are recorded as, "eyes black; bill very dark gray; legs greenish yellow" (Khao Luang).

The male from Khao Bhanam Bencha has the bill and legs similar, but the iris is recorded as, "reddish brown".

Anthreptes malacensis malacensis (Scopoli)

♂, Wat Pa, October 6.

This bird has not been recorded from so far north in Siam before.

Anthreptes singalensis koratensis (Kloss)

2 ♂, ♀, Chanuman January 20-February 12; ♀, Kemraj, December 30; ♀, Khao Soi Dao (3500 ft.), ♂, Khao Sabab (3500 ft.); May 20.

Birds from Kon Ken and Bua Yai are quite typical of this form.

Anthreptes singalensis interposita (Robinson and Kloss)

2 ♂, ♂ imm., ♀, Wat Pa, October 17-November 1; 2 ♂, Ban Thung Luang, January 15; 3 ♂, Khao Luang (3400 ft.), August 16-September

11; 3 ♂, 4 ♀, Khao Bhanam Bencha (3500 ft.), August 9-September 16.

Wat Pa is apparently where the two forms, *koratensis* and *interposita*, meet.

The males are quite typical of *interposita* but the single female is equally typical of *koratensis*.

Nectarinia sperata brasiliiana (Gmelin)

2 ♂, 2 ♀, Kratt, November 23-29; ♂, Rayong, October 20; ♂, Tachin, October 12.

Nectarinia jugularis flammaxillaris Blyth

♂, Srisawat, June 29; 2 ♂, Wat Pa, October 6, 7; ♂, ♀, Rayong, October 12, 13; ♂, Keng Sok, March 11; ♂, Kemraj, December 29; ♂, Khulu, December 19; 3 ♂, ♀, Chanuman, January 15-February 10; 2 ♂, Khao Luang (3400 ft.), August 15; ♂, Khao Nok Wua (2000 ft.), September 23.

Nectarinia asiatica intermedia (Hume)

3 ♂, Chanuman, January 14-February 12; 2 ♂, ♀, Kemraj, December 30-January 2; 2 ♂, Khulu, December 20.

Aethopyga siparaja trangensis new subspecies

Type.—♂ ad.; A.N.S.P. no 127493, collected on Khao Bhanam Bencha (3500 ft.), Trang on August 30, 1936, by Lucas Bah.

Description.—Differs from both *siparaja* and *cara*, by having the underparts green, almost as green as in *seheriae*, instead of blackish as in *siparaja* or gray as in *cara*.

The crown patch, which is more extensive than in *siparaja*, more as in *cara*, is either green or purple, in this respect unstable and resembling the form to the north or south of it.

From *seheriae* this new form differs by smaller size, somewhat duller green undersurface and purple instead of green tail.

Measurements of type.—Wing 54, tail 42, exposed culmen 16 mm.

Range.—Known only from the province of Trang, peninsular Siam.

Material examined.—*A. s. siparaja*, 7 ♂, 3 ♀, Pulo Tello, Batu Is.; 2 ♂, ♀, Hilisimetano, Nias I. [Ripley (Bull. Mus. Comp. Zool., XCIV, 1944, p. 407) considers birds from the islands off the west coast of Sumatra as belonging to the nominate form.]

Ae. s. cara, 12 ♂, Khao Luang (3400 ft.); 2 ♂, Kratt; 3 ♂, Khao Soi Dao (3500 ft.); 2 ♂, ♀, Sriracha; 4 ♂, Chantaboon; ♂, Me Poon; 5 ♂, Bua Yai, Siam. ♂, Kawkarik, Tenasserim.

Ae. s. seheriae, ♂, Keng Tung; ♀, Meng Pek; ♂, Pang Hsang; ♂, Kyu Loi, Southern Shan States.

Ae. s. trangensis, ♂, Waterfall, Trang; 9 ♂, ♀, Khao Bhanam Bencha (2000-3500 ft.).

Remarks.—Occasional specimens of *cara* from Khao Luang have a greenish tint on the undersurface, but this is never as bright green as in *trangensis*. Young males usually have this green tint on the under surface.

The male from the Waterfall is really intermediate between *trangensis* and *siparaja*. The breast is almost blackish where it meets the red of the upper breast, but then fades rapidly to grayish green on the flanks and belly.

Deignan, to whom I sent my specimens for comparison with peninsular examples of *siparaja* writes me, "Our Trang specimens would be best placed with your new form—we have 5 ♂ ♂. But they are not as well marked as the Bencha birds as you might expect farther south (near *siparaja*)."

***Aethopyga siparaja cara* Hume**

3 ♂, Khao Soi Dao (3500 ft.), May 17-20; 2 ♂, Kratt, November 29-December 3; 11 ♂, Khao Luang (3400 ft.), August 10-26; ♂, Khao Nok Wua (2000 ft.), September 25.

***Aethopyga siparaja mangini* Delacour and Jabouille**

♂ Chanuman, February 11.

Very like *cara* but the tail green instead of purplish blue. Not previously recorded from Siam.

Birds from Bua Yai show a slight approach to the Chanuman bird in having the tail and upper tail-coverts more greenish than in peninsular specimens.

***Arachnothera longirostra antelia* Oberholser**

♀, Srisawat, July 6; ♂, Rayong, October 20; ♂, Khao Sabab (3000 ft.), June 17; 2 ♂, 2 ♀, Kratt, December 1-5; 2 ♂, Khao Soi Dao, May 6-24; 2 ♂, ♀, Khao Luang (3400 ft.), August 9-16; 3 ♂, ♀, Khao Bhanam Benchá, (3500 ft.), August 3-30.

The soft parts of a male from Khao Soi Dao are recorded as, "eyes dark brown; bill dark gray; legs blue-gray." An immature male collected by Dillon Ripley at Meloewak, Sumatra is recorded as having the "feet yellowish white; lower mand. yellow." This seems to be the normal coloring of immature birds, for one from Nakon Sritamarat, and one from Mt. Ranai, Great Natuna I., have pale feet and lower mandible in the skin.

I have little material for comparison and use Oberholser's name because it was founded on a bird from Trang.

***Arachnothera affinis modesta* (Eyton)**

2 ♂, ♀, Khao Luang (3400 ft.), August 9-16; 6 ♂, Khao Bhanam Benchá (3500 ft.), August 13-30; ♂, Waterfall, Trang, October 1.

This species does not seem to have been recorded from so far north before. Two birds from Khao Luang are not fully adult.

The soft parts of an adult male from Khao Luang are marked, "eyes light brown; bill, upper light gray, lower pinkish gray; legs flesh color."

Arachnothera robusta robusta Müller and Schlegel

♂, ♀, Waterfall, Trang, October 2-9.

These two specimens differ from a January Sumatra example by having the upper surface greener, less bronzy and the belly more lemon, less golden yellow. Three other Sumatran examples have the chest and throat considerably grayer, but these three were taken in May, and the season probably accounts for the difference. The two Malayan birds, however, have longer bills.

Arachnothera crassirostris (Reichenbach)

♂, Khao Bhanam Bencha (3500 ft.), August 30.

Arachnothera flavigaster (Eyton)

2 ♂, Khao Luang (3400 ft.), August 17; ♂, Khao Bhanam Bencha (3500 ft.), August 30.

The only previous Siamese localities from which this species has been recorded are Chong, Trang (2 ♂), the island of Puket (one specimen), and Nakon Sritamarat (♂). It must be rare in Siam for neither Abbott, Gyldenstolpe or Smith secured it.

It is surprising to find this Malayan species as far north as Khao Luang. Birds from that locality agree with our other two from farther south.

DICAEIDAE

Dicaeum cruentatum siamense Kloss

2 ♂, Chanuman, February 11, 12; 2 ♂, Kemraj, December 29, 30; ♂, Khulu, December 18; ♂, Khao Sabab (3000 ft.), June 22; ♂, Tachin, October 12; ♂, Pran, March 16; ♀, Khao Luang (3400 ft.), August 22.

Dicaeum concolor olivaceum Walden

♂, Kemraj, January 3; 2 ♂, Chanuman, January 27, February 7.

These birds seem a trifle greener above than birds from northern Siam.

Dicaeum trigonostigmum rubropygium Baker

♂ Khao Bhanam Bencha (3500 ft.), August 3.

Dicaeum chrysorrheum chrysochlore Blyth

♂, 2 ♀, Khulu, December 26, 27; 2 ♂, Kemraj, December 27, January 2; ♂, Chanuman, February 9; 2 ♀, Khao Luang (3400 ft.), August 21.

A female from Khao Luang is marked, "eyes red; bill, upper very dark gray, lower blue-gray; legs blue gray." A female from Khulu is similar with the exception of the iris which is recorded as "orange."

Dicaeum chrysorrheum chrysorrheum Temminck

♂, Khao Bhanam Bencha, September 9.

Piprisoma agile pallescens Riley

♂, Khulu, December 17.

Anaimos percussus ignicapillus (Eyton)

♂, ♀, Khao Bhanam Bencha (3500 ft.), August 9, 16.

The soft parts of the male are recorded as, "eyes light brown; beak and legs gray."

ZOSTEROPIDAE*Zosterops japonica simplex* Swinhoe

♂, Khulu, January 3; 2 ♂, ♀, Kemraj, December 26-29; ♂, Chanuman, February 7.

A male from Khulu is marked, "eyes light brown; upper beak dark gray, lower beak light gray; legs light gray."

Zosterops palpebrosa aureiventer Hume

♀, Khao Luang (3400 ft.), August 17; 2 ♂, ♀, Khao Bhanam Bencha (3500 ft.), August 30; ♀, Waterfall, Trang, October 2.

The bird from Khao Luang is marked, "eyes chestnut; bill black; legs blue gray."

The specimen from the Waterfall, in the lowlands, is exactly like birds from 3500 ft.

PLOCEIDAE*Lonchura striata subsquamicollis* (Baker)

2 ♂, 3 ♀, Kemraj, December 31, January 1; ♂, Khao Bhanam Bencha (3500 ft.), August 31.

Birds from Kemraj agree with our single bird from the peninsula, and not with those from northern Siam. North Siamese birds (*acuticauda*) have the throat and the center of the breast blacker, the feathers of the sides and lower portion of the breast less conspicuously margined with grayish brown.

Passer flaveolus Blyth

3 ♂, ♀, Wat Pa, October 4-8.

FRINGILLIDAE*Emberiza aureola ornata* Schulpin

♂, ♀, Pran, March 18.

We also have a pair from Petriu taken on May 6 and 8. In a large series from eastern China we have birds from Kiangsu taken as early as May 2.

Emberiza rutila Pallas

♂, 2 ♀, Pran, March 16-18.

RECONSIDERATION OF THE BACOPA-HERPESTIS PROBLEM OF THE SCROPHULARIACEAE

BY FRANCIS W. PENNELL

An inconsistency in my account of "The Scrophulariaceae of Eastern Temperate North America", that was fully realized at the time of issuing that study in 1935, was the difference in treatment accorded the *Lindernia-Ilysanthes* and the *Bacopa-Herpestis* groups, the former including therein only genus 16, *Lindernia*, but the latter the genera 1-6, *Bramia*, *Hydrotrida*, *Macuillamia*, *Hydrantheium*, *Herpestis*, and *Pagesia*. In the one case I seemed constructively conservative, in the other bent upon the recognition of all genera possible. The treatment was illogical, but I hoped that the statement that I was passing on the latter genera until such time as the *Bacopa-Herpestis* complex could be reviewed in its main region, the Neotropical, would make the procedure forgivable. Although I have not seen these plants in eastern South America, the territory of their main occurrence, I have now assembled more specimens and data as to types of the various species, and also have at hand comparative drawings¹ of representative members of each of the subgroups involved. With further information I wish to consider this problem anew.

Why was the treatment accorded these two groups in my monograph so different? It resulted from the very different taxonomic worth of the comprehensive genera that would be formed in either case by uniting the associated small genera. In the one case "by the union of the four-anthered *Lindernia* All. and *Vandellia* L. with the two-anthered *Ilysanthes* Raf. and *Bonnaya* Link & Otto is formed a large and clearly natural genus," one "characterized by the remarkably uniform corolla (with narrow posterior lip much shorter than the widely spreading anterior lip), by similar curiously recurving anterior filaments (the proximal portion of each projecting as if it were an appendage and the filament forked, although actually the process is formed by the sharp inbending of the filament), and by similar

¹ From 1938 to 1940 Mrs. Mildred Appel prepared excellent sketches of floral and fruiting structures toward a comparative study of the genera of Scrophulariaceae in the New World.

septicidal dehiscence of the capsule (that nearly always leaves the entire septum persisting as a median plate)." Such specialized structures denote actual relationship.

But what results if we combine into a comprehensive genus *Bacopa* Aublet all that von Wettstein placed in it², and which some seem so anxious to retain therein? We would have a genus so comprehensive that the habit of the plant would be either erect, diffuse, or repent; its leaves either pinnately or palmately veined; its pedicels either with or without a pair of bracteoles; its sepals either slightly or strongly unequal in size and form, but in a few species equal and alike; its corolla either strongly zygomorphic and pubescent within on the upper side, or else widened, campanulate and glabrous within on all sides, while in color its limb would be either xanthic or cyanic; its stamens either 5, 4 (usually), 3, or 2; its ovary with or without a surrounding circle of bristles; its stigmas either distinct (sometimes the styles also parted distally) or somewhat joined; and its capsule either septicidal, both septicidal and loculicidal, or mainly loculicidal. I would not know how to define such an aggregate in contrast to other members of the tribe Gratioleae, and certainly Wettstein did not, as his sole key distinction between *Bacopa* and *Mimetanthe* was that the former had its corolla nearly actinomorphic, the latter evidently zygomorphic, a characterization that would transfer over half his species of *Bacopa* to *Mimetanthe*! His next superior character is that both these genera agree in having the uppermost calyx-lobe broader or longer than the others. The latter condition applies to *Mimetanthe*, its uppermost sepal being longest as in *Mimulus*; because the sepals are joined as they are in that genus (though only partially), and other features of flowers and fruit accord, I have little hesitation in returning *Mimetanthe* Greene to its old position as a section of *Mimulus* L. But in Wettstein's comprehensive *Bacopa* the uppermost sepal is the widest rather than the longest, nor are the sepals joined. A calyx composed of five dissimilar sepals is our best character for the *Bacopa-Herpestis* group.

Yet, this criterion meets exception, since there are a few species which have been long, and correctly, associated with this alliance in which the sepals are alike. These are aquatic plants, which in 1920 I described as a separate genus *Naiadothrix*. The palmatifid leaves of these plants, with segments again pinnatifid, contrast them so strongly with the entire to serrate leaves of other members of this group that one would like to separate them at once. But they have one structural peculiarity that connects them so intimately with certain normal-leaved members that their status can not be decided until that feature is duly taken up. That is the development

² In Die Natürlichen Pflanzenfamilien, IV, 3b: 76, 1891.

of a circle of bristles surrounding the base of the ovary,—the feature on which Bentham in 1846 established his section *Chaetodiscus* of *Herpestis*, and which is shared by both *Hydrotrida* and *Naiadothrix* among recently recognized genera.

Even could we promptly dispose of *Naiadothrix*, would we find the dissimilarity of the sepals a sure guide to relationship? It is a remarkable development that is restricted in the Scrophulariaceae to the tribe Gratioleae, but there it occurs in various groups that on other characters seem distinct enough. (In taxonomy one is repeatedly impressed with the fact that characters as peculiar as this seem to have come into being along parallel genetic lines, rather than but a single time.) It marks also *Achetaria* C. & S. and *Dizygostemon* Radlk. of eastern tropical South America, as well as *Adenosma* R. Brown of the Malayo-Australasian region. If possible, we must establish, within the *Bacopa-Herpestis* complex, genera that are demarcated by more exclusive correlations of characters. Are there, within this complex, correlations that denote natural associations of species at all comparable in validity to that of *Lindernia*?

There is one such association. It removes from our complex those species that have a purely septicidal dehiscence of the capsule, a xanthic coloration of the corolla-limb, stiped anther-cells, bracteoles placed at the base of the pedicels, and that show a tendency of the herbage to blacken in drying. Moreover, these species agree in having the corolla zygomorphic and hairy within over the base of the upper lobes, the stamens 4 and didynamous, the uppermost sepal not reticulate-veiny nor wider than ovate, the leaves pinnately veined and serrate, and the plant usually perennial (though in at least one species annual). Together these constitute a remarkable correlation of characters, some of which call for special consideration: Xanthic (yellow) as opposed to cyanic (violet-blue) forms a color-contrast that usually characterizes genera, tribes, or even families, though (as in this case) either xanthic or cyanic groups may have white-flowered members. Stiped anther-cells characterize *Stemodia* L. and its allies, and suggest that our species have affinities with that group of genera.³ Finally, the location of the bracteoles at the base of the pedicels is a character seemingly unique in this group of species.

From Bentham's revision of the Scrophulariaceae in 1846⁴ this group has been identified with *Mecardonia* Ruiz & Pavon, forming his section

³ *Achetaria*, *Adenosma*, and *Dizygostemon*, mentioned in the preceding paragraph as having dissimilar sepals, all have stiped anther-cells, but each shows correlations of characters sufficient to distinguish it well from the plants now under consideration. The fact that our present species have such anthers was first discovered when flowers of *Mecardonia vandelliioides* were dissected for Mrs. Appel's drawing.

⁴ In DeCandolle's "Prodromus Systematis Naturalis Regni Vegetabilis", 10: 186-586, *Herpestis* pages 392 to 400, *Bacopa* p. 401, *Hydrantheum* p. 425.

Mecardonia of the genus *Herpestis* Gaertn. f., whence it became in von Wettstein's treatment of 1891 a similarly named section of *Bacopa* Aubl. In 1903, in his "Flora of the Southeastern United States" (p. 1064), Dr. John K. Small restored Ruiz & Pavon's genus. In my Eastern Scrophulariaceae⁵ I have demurred, not seeing how Ruiz & Pavon's detailed description of the calyx, as stated in their Prodrömus, could be applied to these plants. The calyx was originally described as seven-leaved, the outermost portion consisting of two shorter subulate little leaves; such structures characterize many other species of the *Bacopa-Herpestis* complex, but in the present group the sepals are clearly five and without bracteoles so closely associated that they would easily be accounted part of the calyx. On this account I have for ten years been calling these plants *Pagesia*. But reconsideration now leads me, most unexpectedly to myself, to approve Bentham's identification of the present group as *Mecardonia* R. & P.

This is on two counts. Ruiz & Pavon describe those two offending external leaflets as deciduous, whereas the other sepals are all persistent. Evidently they were not to be found on mature pedicels. We know of no such deciduous bracteoles in this group, but probably the matter is explicable in this wise. These authors had their drawings made from nature in Peru, and it may well be that first a bud of this plant was examined in which, before the lengthening of the pedicel, two bracteoles were seen as if belonging to the actual calyx; then later, on examining the plant in flower, no such bracteoles were found beneath the calyx and the assumption seemed warranted that they had dropped off. We now know that in the process of coming into blossom the pedicels had lengthened, leaving the pair of bracteoles inconspicuously at their base. (I have also objected to the style being called filiform, but it is, as stated, shorter than the stamens, and in some species incurved, as shown in Miss Eaton's drawing in my Monograph.) I incline to think that the widespread tropical weed that I have been calling *Pagesia dianthera* best fits Ruiz & Pavon's description. It certainly does that of their species *ovata*, since, more than any other of the *Bacopa-Herpestis* alliance, its leaves conform to the brief characterization in the "Systema Vegetabilium Florae Peruvianaë et Chilensis" (p. 164): "*M. foliis ovatis serratis.*"

Thus, the first count for identifying Ruiz & Pavon's description with *Pagesia dianthera* is that it alone, although by some special interpreting, can be made to fit the original description of *Mecardonia* and its single species *ovata* of central Peru. The second count is that no other eligible candidate for such identification is as yet known from that district. This in itself would not be so significant, since so many plants still unknown to

⁵ Monog. Acad. Nat. Sci. Phila., 1: 64, 1935.

science occur there, if it were not for the singular abundance of this particular species. It is a plant that Ruiz & Pavon must certainly have seen repeatedly, but otherwise it is not accounted for in their works. This seems to me a strong supporting claim for the present identification of *Mecardonia*.

There are three subsequent generic and subgeneric names for what I am now calling *Mecardonia*, and all of these were proposed by Rafinesque. In his "Florula Ludoviciana" (p. 48) of 1817 was *Pagesia*, based upon a careful description by C. C. Robin in his "Flore Louisianaise"⁶ of 1807, who among other details mentioned the "two small leaves on each side of the axilla of the leaves", an evident reference to the peculiarly placed bracteoles. The ensuing year, in the American Monthly and Critical Review (3: 101, 1818) Rafinesque proposed for *Gratiola acuminata* Walter his genus *Endopogon*⁷, as "intermediate between *Gratiola* and *Herpestis*, having the corolla of the former and the stamina of the latter," and he named it for the *Gratiola*-like brush of hairs over the base of the upper corolla-lobes. In corolla *Mecardonia* is wholly like *Gratiola*, but the fertile stamens are 4 (instead of 2) and the connectives are not enlarged. Finally, in the Autikon Botanikon (p. 43) of 1840, Rafinesque transferred "all the Gratiroleae with 4 fertile stamens... to [*Ambulia*] Subg. *Aotalix*", there newly proposed and characterized. Since in each instance he had actually *Gratiola acuminata* in mind, we perceive that Rafinesque placed this uniform species in as many as three genera!

Mecardonia pertains to both North and South America, occurring from Maryland, Missouri, Arizona, and Lower California to Argentina. It is mainly a genus of the eastern portions of both continents. Its species comprise at least: *M. acuminata* (Walter) Small, of the southeastern United States; *M. caespitosa* (*Herpestis caespitosa* Chamisso), of Brazil; *M. dianthera* (*Lindernia dianthera* Swartz), of Hispaniola, including *M. ovata* Ruiz & Pavon, of Peru and *H. chamaedryoides* Humboldt, Bonpland, & Kunth, of Ecuador; *M. divaricata* (*H. divaricata* Schmidt), of Brazil; *M. exilis* (*H. exilis* Brandege), of Lower California; *M. grandiflora* (*H. grandiflora* Benth.), of Argentina; *M. herniarioides* (*H. herniarioides* Cham.), of Brazil; *M. montevidensis* (*H. montevidensis* Sprengel), of Uruguay, including *H. flagellaris* Chamisso & Schlechtendal; *M. peduncularis* (Benth.) Small, of Texas; *M. procumbens* (Miller) Small, of eastern Mexico; *M. radicata* (*H. radicata* Benth.), of Argentina; *M. serpylloides* (*H. serpylloides* C. & S.), of Brazil⁸; *M. tenella* (*H. tenella* C. & S.), of Brazil; and *M. vandellioides* (*H. vandellioides* H.B.K.), of Mexico.

⁶ In his "Voyage dans l'intérieur de la Louisiane . . .", 3: 406.

⁷ Name not in Index Kewensis, but now brought to light by Rafinesque's botanical bibliographer, Dr. E. D. Merrill.

⁸ Corolla yellow to reddish, but still xanthic.

With *Mecardonia* now removed, our *Bacopa-Herpestis* complex may be defined as embracing species with the capsule either equally septicidal and loculicidal or else dominantly loculicidal, the corolla of cyanic coloration, the anther-cells closely sessile, the bracteoles placed just beneath or near the calyx or else lacking, and the herbage not blackening in drying. Of these characters the capsule-dehiscence and the coloration of the corolla are positive and I think denote relationship, but the anther-cells and the bracteoles (when present) show a generalized condition widespread among the Gratiolaceae. Turning to other features not so distinctive from *Mecardonia*, we find that this complex still comprises plants that are erect, diffuse, or repent; with leaves either pinnately or palmately veined; with sepals either slightly or strongly dissimilar, or else actually similar; with corolla either zygomorphic and pubescent within on the upper side, or else glabrous within, or else campanulate and either generally pubescent or glabrous within on all sides; with stamens either 5, 4, 3, or 2; with or without a circle of bristles around the base of the ovary; and with the stigmas either distinct (sometimes even the styles parted distally) or somewhat joined. It is evident that we have reached no such definite entity as is *Mecardonia*.

Nor is it possible to find divisions within this complex that are of such validity. Various correlations of characters occur, but each character may also appear in association with some other member of a contrast. Yet I have been exceedingly reluctant to hold such a heterogeneous assemblage in a single generic alliance because of the anticipated worth of these different characters. They are not such as one expects to vary so freely. Let us consider each of these variants within our aggregate *Bacopa*.

In duration the plants are normally annual, although one does not know the span of life of such a creeper as *Bacopa monnieri*. The species of sections *Mella* and *Eubacopa* are erect, whereas those of *Herpestis* and *Chaetodiscus* are elongated and lax, and of *Bramia* are repent. Such differences may be expected within a single genus. The leaf-venation shows differences more difficult to associate. In some species of *Mella* (e.g. *B. domingensis* and *B. stricta*) the blades are petioled and wholly pinnately veined, in other species (*B. angulata*, *B. bacopoides*, *B. laxiflora*, etc.) they narrow to a cuneate sessile base from which lateral veins extend through the proximal half of the blade though the distal portion remains pinnately veined, and in still other species of *Mella* (*B. conferta*, *B. gratioloides* and *B. monnieroides*) the few veins seem to come nearly wholly from the base so that the sessile leaf has become palmately veined; yet, from any species of *Mella* it seems a decided jump to the wholly palmately veined sessile or clasping leaves of *Herpestis*, *Chaetodiscus*, and *Silvinula*. The differences are greater than would be expected within a single genus, but the various

species of *Mella* show how it has come about. Bracteoles beneath the calyx may be present or lacking; this difference usually marks genera although in *Gratiola* L. both states exist, *G. ebracteata* showing how bracteoles become lost. The sepals show surprising differences in degree of diversity, but such as could occur within a close alliance; these differences mark certain subordinate groups. The corolla-form seems hopelessly diversified until one compares a long sequence of species and perceives by what gradual stages one passes from the most zygomorphic condition (as in species of *Mella*, e. g. *B. angulata* and *B. laxiflora*), through those that have lost the hairs over the upper side of the orifice (e. g. *B. congesta*) to those with the lobes scarcely differing (e. g. *B. monnieroides*, *B. gratioloides*), and thence to the open campanulate corollas of *Eubacopa*, *Herpestis*, and *Chaetodiscus*, with a special development into the salverform corolla of *Silvinula*. The most promising correlation within the group is that of campanulate corolla with lax habit and palmately veined leaves that characterizes *Herpestis* and *Chaetodiscus*, but *Eubacopa* and *Bramia*, with equally campanulate corolla, have leaves that are pinnately veined (in *Bramia* so distally). The stigmas may be distinct, as is normal for the tribe Gratiroleae (of which such stigmas form the best distinguishing character) or they may become somewhat fused together; at first I had thought that the latter state, so atypical for its tribe, pertained only to *Bramia*, but I find it also in *Herpestis*, subsect. *Mono-cardia*. Needless to say, one does not expect to find such a difference, even though it is only one of degree, within a single alliance. It is, however, natural that every character should somewhere be found in a state of evolutionary flux, or how could there have ever been change from one type of structure to another? But it is surprising to find so many important features fluid in a single alliance.

The most remarkable character of all remains for mention. This is the circle of bristles that marks Bentham's section *Chaetodiscus*, the groups recently treated as genera *Hydrotrida* and *Naiadothrix*. They are outgrowths of the disk that is evident beneath the ovary in all these plants. But the formation of slender hair-like processes, which we can term bristles, from this disk appears to be restricted in the Scrophulariaceae to these few species. It is obviously a real point of relationship, and one to which I would like to give generic status. But the species that show it are all on the *Herpestis* side of *Bacopa*, showing lax stems with palmately veined leaves, and one finds no other character sufficiently correlated with this disk to isolate even the species that show it. Unless one were to form a genus upon a single character, and thus put apart plants that in other features resemble several other associations of species, not even the presence of this remarkable circle of bristles can be used for the establishment of a genus.

It is very reluctantly that I am relinquishing so many promising and supposedly deep-seated characters, and building anew the complex and heterogeneous genus *Bacopa*. That I have not been alone in thinking that this association should be considered as rather a group of genera is evident enough when one surveys the remarkably large number of generic proposals that have been suggested in it. But by keeping these plants together we can at least get a better picture of their phylogeny.

I think that we may consider that *Bacopa* has developed from ancestry that had many characters in common with *Gratiola* and *Mecardonia*. A similar upright habit, with pinnately veined leaves, bracteoles present (in normal position beneath the calyx as in *Gratiola*), zygomorphic corolla, that is hairy on the upper side of the orifice, two pairs of didynamous stamens (as in *Mecardonia*), and two distinct stigmas must have been present. Certain species of *Bacopa*, sect. *Mella*, show all these characters. From such a condition changes developed largely in response to increasingly hydrophytic conditions. A dominant trend has been to the lax habit, palmately veined leaves, and campanulate corolla of sect. *Herpestis*. Such laxness and such broad relatively buoyant leaves are usual to many aquatic plants, as is also the further stage of the finely dissected leaves of sect. *Chaetodiscus*, subsect. *Naiadothrix*. As to corolla change a peculiar evolutionary eddy seems to have produced sect. *Eubacopa*, holding as it does the foliage of the more primitive species of *Mella*, yet developing a campanulate corolla that, just as in *Verbascum* and *Capraria*, has associated with it the resuscitation of the fifth posterior stamen.⁹ *Bramia* has 4-stamened flowers and lax habit, but leaves not palmately veined. The main trend through *Herpestis* has resulted more usually in flowers reduced in size and in the number of parts. Such corollas also occur freely in *Mella*, and are in all cases modified for self-pollination, the stigmas tending to cohere each to an anther. In extreme forms like *Bacopa cyclophylla* the stamens become reduced to two, while the styles part distally so as to enable each stigma to attach more directly to its anther. It is in a closely parallel line to *Herpestis* that sect. *Chaetodiscus* has developed, its species retaining the bracteoles (which have disappeared in *Herpestis*), but acquiring the peculiar circle of bristles around the ovary; then from *Chaetodiscus* subsect. *Hydrotrida*, so like *Herpestis* in aspect, seem to have come the increasingly aquatic subsections with finely dissected water-leaves, *Myriophylloides* and *Naiadothrix*, the last with loss of bracteoles and of dissimilarity of sepals. Finally, from stock near that of *Herpestis* and *Chaetodiscus*, seems to have developed sect. *Silvinula*, with palmately veined leaves, with bracteoles, and with the unique peculiarity among these plants of salverform corollas. These differences and this evolutionary progress I have attempted to present

⁹ See Monog. Acad. Nat. Sci. Phila., 1: 35, 109, 1935.

in the following key to the sections of *Bacopa*. (Generic synonymies will be summarized under these sections.)

- A. Leaf-blades much longer than wide, distally narrowed to an acute or obtusish tip, pinnately veined to palmately so (with the few lateral veins faint), serrate to nearly entire (very rarely palmatifid); stems erect or diffusely spreading; pedicels usually shorter than, to about equaling (sometimes even thrice as long as) the sepals; bracteoles present (or absent in two anomalous species of *Mella*).
 - B. Corolla zygomorphic; stamens 4; capsule longer than wide, its walls firm.
 - I. *Mella*
 - BB. Corolla campanulate; stamens 5; capsule larger, nearly globose, its walls membranousII. *Eubacopa*
- AA. Leaf-blades distally rounded, palmately or 1-veined, entire to crenate or else palmatifid;¹⁰ stems lax, repent or ascending (often water-borne); pedicels equaling to usually longer than the sepals.
 - B. Corolla campanulate (or rarely zygomorphic in *Chaetodiscus*); sepals and capsule plane or inconspicuously ridged.
 - C. Blades of leaves 1-veined (this distally with side-branches); bracteoles present; stigmas somewhat united, so as to seem semi-capitate; plants extensively repent.III. *Bramia*
 - CC. Blades of leaves palmately several-veined throughout or else palmatifid; stigmas usually distinct (sometimes somewhat united in *Herpestis*, subsect. *Monocardia*).
 - D. Bristles surrounding base of ovary not developed; bracteoles none; leaf-blades entire.IV. *Herpestis*
 - DD. Bristles surrounding base of ovary developed; bracteoles present (in *Hydrotrida* and *Myriophylloides*) or lacking (in *Naiadothrix*); leaf-blades entire to crenate (in *Hydrotrida*) to simply palmatifid (in *Myriophylloides*) or the palmatifid segments pinnatifid-dissected (in *Naiadothrix*).V. *Chaetodiscus*
 - BB. Corolla salverform, violet-blue; sepals and capsule longitudinally ridged; bracteoles present.VI. *Silvinula*

Bacopa, sect. I, *Mella* (Vandelli) Wettstein

Mella Vand., Fl. Lusit. et Bras. Spec., 43, fig. 23, 1788. Generic diagnosis only, based upon material from Brazil. Under International Rules of Nomenclature this counts publication, even though no generitype can be assigned.

Caconapea Cham. in Linnaea, 8: 28, 1833. Generitype, *C. gratioloides* Cham., of Brazil, the only original species. In my papers on the Scrophulariaceae of Colombia (1920) and of Cuba (1923) I used this generic name, since the American Code of Nomenclature accepted only the earliest name that could be assigned to a definite type species.

Ranaria Cham., l.c., 30, 1833. Generitype, *B. monnieroides* Cham., of Brazil, the only original species.

Bacopa, sect. *Mella* (Vand.) Wettst. in Die Natürl. Pflanzenfam., IV, 3b: 76, 1891.

This, the largest and most generalized section of *Bacopa*, occurs in the Tropics of both hemispheres. The species are much more numerous in the New World, being found from Cuba and southern Mexico to northern Argentina with greatest frequency in Brazil. In the Old World they occur from Africa to India, Indo-China, and northern Australia. There are at

¹⁰ It has been difficult to decide whether the dissected leaves of sect. *Chaetodiscus*, subsects. *Myriophylloides* and *Naiadothrix*, and also of *Bacopa verticillata* in sect. *Mella*, are actually opposite and palmatifid or else verticillate. I have adopted the former interpretation as best associating them with plants of the present group.

least the following species: *B. acuta* (*Herpestis acuta* S. Moore), of Brazil; *B. angulata* (Benth.) Edwall, of Brazil; *B. arenaria* (Schmidt) Edwall, of Brazil; *B. axillaris* (Benth.) Standley, of Colombia; *B. bacopoides* (Benth.) Edwall, of Brazil; *B. beccabunga* (Grisebach) Robinson, of Cuba; *B. calycina* (*H. calycina* Benth.), of Senegambia; *B. cochlearia* (Huber) L. B. Smith, of Brazil; *B. conferta* (Pennell) Standl., of Colombia; *B. congesta* Chodat & Hassler, of Paraguay; *B. decumbens* (Fernald) F. N. Williams, of Mexico; *B. depressa* (Benth.) Edwall, of Brazil; *B. domingensis* (*H. domingensis* Sprengel), of Hispaniola; *B. elongata* (*H. elongata* Benth.), of Brazil; *B. floribunda* (R. Brown) Wettstein, of Australia; *B. gracilis* (Benth.) Edwall, of Brazil; *B. gratioloides* (Chamisso) Edwall, of Brazil; *B. hamiltoniana* (Benth.) Wettst., of India; *B. hassleriana* Chod., of Paraguay; *B. imbricata* (*H. imbricata* Benth.), of Guiana; *B. lacertosa* Standl., of British Honduras; *B. laxiflora* (Benth.) Edwall, of Brazil, including *H. auriculata* Robinson of Mexico; *B. madagascariensis* (*H. madagascariensis* Benth.), of Madagascar; *B. monnieroides* (Cham.) Robinson, of Brazil, including *Caconapea appressa* Pennell, of Colombia; *B. monosticta* (*H. monosticta* Schlechtendal), of Brazil; *B. paraguariensis* (S. Moore) Hassl., of Paraguay; *B. parvula* (*H. parvula* S. Moore), of Brazil; *B. reptans* (Benth.) Edwall, of Brazil, including *C. debilis* Pennell, of Colombia; *B. sessiliflora* (Benth.) Edwall, of Guiana; *B. stellarioides* (Cham.) Edwall, of Brazil; *B. stemodioides* (*C. stemodioides* Pennell), of Cuba; *B. stricta* (Schrader) Edwall, probably of Brazil; and *B. verticillata* (*C. verticillata* Pennell & Gleason), of Guiana.

As has been stated, these species stand at different levels of evolutionary change as regards leaf-venation and floral structure. *Bacopa domingensis* and *B. stricta* have petioled blades that are wholly pinnately veined; *B. angulata*, *B. axillaris*, *B. bacopoides*, *B. congesta*, *B. floribunda*, *B. lacertosa*, *B. laxiflora*, and *B. sessiliflora* have cuneately sessile blades that are proximally somewhat palmately veined; and *B. conferta*, *B. depressa*, *B. gratioloides*, *B. monnieroides*, and *B. reptans* have narrow sessile blades, that show inconspicuous longitudinal veins through most of their length. As to floral structure some species show fully zygomorphic flowers, but some of the second and all of the third group above bear reduced flowers that tend to be self-pollinated. Finally, *B. arenaria* and *B. cochlearia* are aberrant in the lack of bracteoles; both have zygomorphic corollas that are hairy on the upper side of the orifice, and the latter has remarkably elongated outermost sepal.

Bacopa, sect. II, *Eubacopa* Wettstein

Bacopa, Aubl., Hist. Plant. Guiane Franc., 1: 128, tab. 49, 1775. Generitype, *B. aquatica* Aubl., the only original species.

Only a single species, *Bacopa aquatica* Aublet, of northeastern South America, from Venezuela to the mouth of the Amazon in Brazil.

As explained, the derivation of this peculiar group is from *Mella*, in a manner quite analogous to that of *Capraria* L. from *Pogostoma* Schrader.

Bacopa, Sect. III, **Bramia** (Lamarck) Wettstein

Moniera Juss. ex P. Browne, Hist. Jamaica 269, 1756. Genus described, but its single species given a polynomial name. *Moniera* was adopted by Adanson, Fam. Plant., 2: 212, 1763, and then by Michaux, Fl. Bor. Amer., 2: 22, 1803, (who corrected the spelling to *Monniera*) but it could not overcome the prestige acquired by the Rutaceous *Monniera* L., 1759, a situation that led Pursh, Fl. Amer. Sept., 418, 1814, and his successors, to call the Scrophulariaceous group *Herpestis*. Revived by Kuntze, Rev. Gen. Plant., 2: 462, 1891 as *Monniera*, this earliest name for our whole group has been used by various American workers. But under the International Rules of Nomenclature it has been rejected in favor of *Bacopa* Aubl. of 1775.

Brami Rumph. ex Adans., Fam. Plant., 2: 208, 1763. Generic characters tabularly presented, and without reference to included species. Lamarck in Encyc. Meth. Bot., 1: 459, 1785 properly latinized the name as *Bramia*, and of its single species *B. indica* Lam. he gave a combined generic and specific description. *Bramia* was accounted a section of *Herpestis* by Bentham in Compan. Bot. Mag., 2: 57, 1836, and of *Bacopa* by Wettstein in Die Natürl. Pflanzenfam., IV, 3b: 77, 1891.

Septas Lour., Fl. Cochinch., 392, 1790. Generitype, *S. repens* Lour. of southern China, the only original species. Name antedated by *Septas* L., 1760, for a genus of Crassulaceae.

Calytriplex Ruiz & Pavon, Fl. Peruv. et Chil. Prodr., 96, tab. 19, 1794. Generic description only, but to be typified by *C. obovata* R. & P., Syst. Veg. Fl. Peruv. et Chil., 165, 1798, of Peru, the only original species.

Habershamia Raf., Neogenyton, 2, 1825. Generitype, *H. cuneifolia*, based on *Monniera cuneifolia* Michx. of Carolina.

Septilia Raf., Fl. Tellur., 4: 68, 1838. Proposed for *Septas* Lour., not L. Through a confusing of *Septas repens* Lour. of China with *Gratiola repens* Sw. of Jamaica, *Septilia* was applied by Small, Fl. S.E. U. S., 1064, 1903, to what I am now calling *Bacopa*, Sect. *Herpestis*, Subsect. *Euperpestis*, although Swartz' species actually pertains to Subsect. *Hydranthelium*. (Small also included what he later called *Hydrotrida*.)

Heptas Meisn., Plant. Vasc. Gen. Comm., 202, 1840. Proposed for *Septas* Lour., 1790, not L., 1760.

Anisocalyx Hance in Walp., Ann. Bot. Syst., 3: 195, 1853. Generitype, *A. limnanthiflorus* Hance of southern China (Hongkong), the only original species.

A single species, widespread on and near shores of tropical and warm temperate portions of both hemispheres, growing especially in brackish places both maritime and inland. H. P. Guppy, in his "Plants, Seeds, and Currents in the West Indies and Azores" (p. 277, 1917), says of this and certain associates: "Doubtless much of the cosmopolitan range of each of these plants is due to the agency of the drifting log bearing the seeds in its crevices, to the unintentional assistance of aboriginal man in his long canoe voyages, and to birds." However it has been accomplished, this plant extended itself at an early date (presumably long before history) from the New to the Old World tropics, and has colonized most suitable areas in both.

*Bacopa monnieri*¹¹ (*Lysimachia monnieri* Torner, curante Linnaeo) may be readily recognized by its cuneate-obovate leaves, its extensively creeping habit, and its white or pale violet-bluish campanulate flowers. The leaves vary somewhat in size, but without the correlation with tropical or subtropical climate that Prof. Fernald emphasizes. Plants seen from Florida, Texas, southern Mexico, Yucatan, Peru, Paraguay, India, and the Hawaiian Islands comprise in each of these areas individuals with small leaves and others with leaves of twice to four times the size. Accordingly, I do not think that Fernald is warranted in counting the plant of the coast of our southeastern states as a geographical variety because of its leaves being larger than in the pantropic species.

There is in the West Indies a pronounced trend to reduction of foliage, culminating in the Cuban plant that Grisebach, Cat. Plant. Cub., 183, 1866, described as *Herpestis micromonnieria*. The leaf-blades are so shortened as to be approximately circular. This I take to be the plant from Jamaica that Browne described as "*Moniera minima* . . . , foliis subrotundis . . .", but that was not the type of Torner's original species (even though it became associated with it in the *Amoenitates Academicæ*), as is shown by his characterization of the leaves as "*foliis ovali-oblongis*", thus indicating the usual elongated foliage of this species (under which I would confidently place both the specimens shown on Fernald's plate 401). As to the source of his material, which became definitely credited to Jamaica in the *Amoenitates*, Torner's original account gave it as growing "*in America meridionali*" and as collected by Hallman. Now, D. Z. Hallman sent to Linnaeus plants from Spain, including many which had been obtained from the Spanish New World. There seems little reason to doubt that the source of *Lysimachia monnieri* was from some portion of coastal South America, and that it was the usual widespread form of the species, rather than its small-leaved West Indian derivative. The latter may be called *Bacopa monnieri micromonnieria* (*Herpestis micromonnieria* Griseb.).

Bacopa, Sect. IV, *Herpestis* (C. F. Gaertner)

Within this section there is definite evolutionary change. In *Monoecardia* the corolla is usually violet-blue and conspicuous, the stamens four,

¹¹ In *Rhodora*, 37: 440, 1935, Professor Fernald objects to my altering the long used specific name of this plant from *monnieria* to *monnieri*, claiming that its appearance in *Lysimachia monnieri*, Cent. Plant., 2: 9, 1756 should be counted as "a typographic or orthographic error". But, if so, it has been twice made, since the name appeared as *Gratiola monnieri* in Linnaeus, *Systema Naturæ*, ed. X, 851, June, 1759, whereas only in the reprinted theses of the *Amoenitates Academicæ*, 4: 306, issued in November, 1759 do we find it as *Gratiola monnieria*. I think it clear that Linnaeus, acting through his pupil Eric Torner, made first the genitive *monnieri*, but later changed it to the more euphonious substantive *monnieria*. Unfortunately, the Rules make us adhere to the earlier form of the word.

the styles wholly united with the stigmas contiguous or somewhat united as in *Bramia*, and the plants occur in wet soil though scarcely as genuine aquatics. In *Euherpestis* and *Hydrantheium* the corolla is white and becomes smaller (as self-replaces cross-pollination), the stamens from 4 to 3 or 2 (the lower pair disappearing), the styles tend to part distally so that each stigma may attach itself to an anther, while the plants become increasingly aquatic, nearly wholly so in *Hydrantheium*. Subsections to be distinguished as follows:

- A. Outermost sepal truncate-rounded to cordate at base, becoming reticulate-venose, 4-8 times the width of the linear innermost sepals.
 - B. Capsule narrow, firm-walled; styles wholly united, the stigmas contiguous or somewhat united; stamens 4, both pairs fully developed; pedicels at least twice as long as the sepals. Subsect. 1, *Monocardia*
 - BB. Capsule ovoid, membranous-walled; styles parted distally; stamens 4, 3, or 2, the anterior pair tending to disappear; pedicels about the length of the sepals. Subsect. 2, *Euherpestis*
- AA. Outermost sepal ovate-rounded or oval, not strongly reticulate, only 2-3 times the width of the innermost oblong-lanceolate sepals; corolla white; capsule globose-ovoid to globose, membranous-walled; styles tending to part distally; stamens 4, 3, or 2, the anterior pair tending to disappear; pedicels at least twice the length of the sepals. Subsect. 3, *Hydrantheium*

Bacopa, Sect. Herpestis, Subsect. 1, MONOCARDIA (Pennell)

Monocardia Pennell in Proc. Acad. Nat. Sci. Phila., 72: 155, 1920. Generitype, *M. violacea* Pennell of Colombia, as designated.

Plants of wet places and shallow pools, both in open and in forest, low-land tropical America from southern Mexico to Brazil. There are at least the following species: *Bacopa albida* (Pennell) Standley, of Colombia; *B. lilacina* (Penn.) Standl., of Colombia, probably including *Monocardia humilis* Penn. of Colombia; and *B. salzmännii* (Benth.) Edwall,¹² of Brazil, including *M. violacea* Penn. of Colombia.

Bacopa, Sect. Herpestis, Subsect. 2, EUHERPESTIS

Herpestis Gaertn. f., Fruct. et Sem. Plant., 3: 186, tab. 214, 1807. Generitype, *H. rotundifolia* Gaertn. f. of Carolina, the only original species.

Plants of fresh-water tidal shores, from Maryland to northern South America. Subject to inundation twice a day, self-pollination is a natural and effective habit for the minute flowers of these and many associated species. According to Prof. Fernald, *B. stragula* has 3 or 4 stamens, but in W. M. Canby's collection from Salisbury, Maryland I find of the anterior pair only a single anther and it reduced to a single anther-cell. In material of *B. cyclophylla* gathered by C. S. Williamson at Wilmington, North Carolina, there are but two stamens and each stigma of the parted styles adheres to an anther. As so few flowers are present on the few collections seen, and these flowers are so minute, the stamen-reduction needs to be checked by inspection of a much more extensive series of specimens.

¹² In this and some other instances Edwall credited the combination to Wettstein, who had not really formed it although he was the one who had established *Bacopa* as the generic name for all these plants.

As Fernald has shown, there are at least two species: *Bacopa cyclophylla* Fernald (*Herpestis rotundifolia* C. F. Gaertner, not *B. rotundifolia* (Michaux) Wettstein) of Carolina; and *B. stragula* Fern., of the Chesapeake drainage of Virginia and Maryland.

Bacopa, Sect. **Herpestis**, Subsect. 3, **HYDRANTHELIUM** (H.B.K.)

Hydranthehium H.B.K., Nov. Gen. et Spec. Plant., 7: 202, tab. 646, 1825. Generitype, *H. callitrichoides* H.B.K., of Venezuela, the only original species.

Ranapalus Kellogg in Proc. Calif. Acad. Sci., 7: 113, 1877. Generitype, *R. eisenii* Kell. of California, the only original species.

This is a natural association of strongly aquatic plants. The flowers show various stages of reduction, in association with obvious self-pollination. Commencing with a nearly 5-lobed 4-stamened state, which I formerly interpreted as *Macuillamia*, this organ becomes smaller and fewer-lobed and the stamens either 4 or 3 or else only 3. The final condition is that originally described for *Hydranthehium*, with 3 corolla-lobes and 3 stamens, the two upper corolla-lobes having completely fused while the mid-anterior lobe has been eliminated. There is also a progression from large broadly rounded and entire leaves to ones that are smaller and in some species sinuately lobed.

This subsection occurs through tropical and temperate America, from Virginia, Dakota, and California to Argentina. There appear to be at least the following species: *Bacopa braunii* (*Hydranthehium braunii* Ernst), of Venezuela; *B. callitrichoides* (*H. callitrichoides* H.B.K.), of Venezuela; *B. connata* (*Herpestis connata* Pennell), of Guiana; *B. egenesis* (*H. egenesis* Poeppig), of Brazil; *B. eisenii* (*Herpestis eisenii* Kellogg), of California; *B. repens* (Swartz) Wettstein, of Jamaica, including *Macuillamia limosa* Pennell of Colombia; *B. rotundifolia* (Michx.) Wettst., of the central United States; *B. simulans* Fernald¹³, of Virginia; and *B. tweediei* (Benth.) Parodi, of Argentina.

Bacopa, Sect. V, **Chaetodiscus** (Bentham) Wettstein

Herpestis, Sect. *Chaetodiscus* Benth. in DC., Prod., 10: 398, 1846.

Bacopa, Sect. *Chaetodiscus* (Benth.) Wettst. in Die Natürl. Pflanzenfam., IV, 3b: 76, 1891.

¹³ Proposed by Fernald in Rhodora, 44: 438, 1942 for the plant which I had identified in Monog. Acad. Nat. Sci. Phila., 1: 60, 1935 as *Macuillamia obovata* Raf. Rafinesque's description included plants from "Virginia in the River Potomac, and in Louisiana." From the latter component, certainly a form of *M. rotundifolia* (Michx.) Raf., I attempted to assort the characters that must have been derived from the Potomac plant, being strongly induced to do this by the recent discovery of a species of this peculiar group in the Chickahominy River by E. J. Grimes. While I still think that that is the plant which Rafinesque meant and that it will eventually be found again in the Potomac River, I am willing, in the absence of any Rafinesquian specimen so named, to leave *M. obovata* unidentified and to accept *Bacopa simulans*. (But, knowing somewhat of Rafinesque's hasty work, I can not follow Fernald in his readiness to accept Rafinesque's brief generic description of 1825 as exactly characterizing a species proposed by him in 1840! And especially so when this species immediately succeeds *Macuillamia rotundifolia*, which also has a 5- instead of 4-lobed corolla!)

Within this section, so evidently natural in its possession of the unique circle of bristles surrounding the base of the ovary and all its members with violet-blue corolla, there is a strong trend toward increasing adaptation to aquatic life. Of the subsections only *Hydrotrida* shows leaves that are entire to crenate and its species are plants of wet places; but *Myriophylloides* and *Naiadothrix* have leaves that are finely dissected and their species are wholly aquatic. *Hydrotrida* is also relatively primitive in the retention of bracteoles beneath the calyx, and these are also held by *Myriophylloides*, whereas they have become wholly lost in *Naiadothrix*. The last group has acquired two further characters that are unique in *Bacopa*; the sepals have quite lost their dissimilarity, and the palmatifid segments of the leaves have a secondary series of fine pinnate divisions. (In adaptation to aquatic life it would seem that a palmate leaf-venation holds the stems buoyant and in position better than does a pinnate one; but for submersed foliage further evolution is toward fine dissection, the utmost surface of this character being supplied by palmatifid segments that in turn have become pinnatifid.) The subsections may be distinguished as follows:

A. Outermost sepal ovate to cordate, much wider than the linear innermost ones; bracteoles present; leaf-blades entire to simply palmatifid.

B. Leaf-blades entire to crenate; corolla campanulate. Subsect. 1, *Hydrotrida*

BB. Leaf-blades finely palmatifid; corolla zygomorphic. Subsect. 2,

Myriophylloides

AA. Outermost sepal not wider than the others, the sepals all alike; corolla zygomorphic; bracteoles lacking; leaf-blades finely dissected, the palmatifid segments in turn pinnatifid. Subsect. 3, *Naiadothrix*

Bacopa, Sect. **Chaetodiscus**, Subsect. 1, **HYDROTRIDA** (Small)

Macuillamia Raf., Neogenyton, 2, 1825. Generic description, but without citation of definite species, which were first associated with this name in Rafinesque's Autikon Botanikon (p. 44) of 1840 as *M. rotundifolia* (Michx.), *M. obovata*, and *M. amplexicaulis* (Michx.). In Monog. Acad. Nat. Sci. Phila., 1: 56, 1935 I thought that the first two showed better the bifid style described, but restudy leads me to doubt this since all three have this feature. But Rafinesque also distinguished his genus "by cor. four cleft, segments obovate, notched," and this characterization certainly applies best to *M. amplexicaulis*, which I now adopt as the generic type.

Hydrotrida Small, Fl. Miami, 165, 1913. Generitype, *H. caroliniana* (Walt.) Small, based upon *Obolaria caroliniana* Walt. of South Carolina. Of Small's two species this is the only previous one, and that with which he evidently thought that the name *Hydrotrida* could be associated. In this he was wrong, since the name had never been validated by description, *Hydrotrida beccabunga* Willd. appearing only in synonymy¹⁴ that places it as a synonym of *Bacopa repens* of our present section *Herpestis*, subsection *Hydranthelium*. Small's description first published Willdenow's name, but in an altered application.

A small association of species, occurring in wet places and by pools, through lowland eastern America from North Carolina to Paraguay. There

¹⁴ Schlechtendal & Chamisso in Linnaea, 5: 107, 1830, under *Herpestis repens* (Sw.) C. & S.; and Steudel, Nomencl. Bot., ed. II, 1: 107, 1840, under *H. obovata* Poepp. Both these names I would place in the synonymy of *Bacopa repens* (Sw.) Wettst.

are at least the following: *Bacopa caroliniana* (Walter) Robinson, of the southeastern United States; *B. ciliata* (*Herpestis ciliata* Pennell), of Guiana; *B. lanigera* (Chamisso & Schlechtendal) Wettstein, of Brazil; *B. marginata* (*Herpestis marginata* Benth.), of Brazil; and *B. serpyllifolia* (*H. serpyllifolia* Benth.), of Brazil.

Bacopa, Sect. **Chaetodiscus**, Subsect. 2, MYRIOPHYILLOIDES

A single aquatic species, *Bacopa myriophylloides* (Benth.) Wettst., of Brazil.

Bacopa, Sect. **Chaetodiscus**, Subsect. 3, NAIADOTHRIX (Pennell)

Naiadotrix Penn. in Mem. Torrey Bot. Club, 16: 105, 1920. Generitype, *N. longipes* Penn. of Cuba, designated.

The most aquatic of Scrophulariaceae, occurring in lowland tropical America from the West Indies to Brazil. There are at least the following species: *Bacopa longipes* (Pennell) Standley, of Cuba; *B. najas* Standl., of British Honduras; and *B. reflexa* (Benth.) Edwall, of Brazil.

Bacopa, Sect. VI, **Silvinula** (Pennell)

Silvinula Penn. in Mem. Torrey Bot. Club, 16: 103, 1920. Generitype, *S. humifusa* (Griseb.) Penn. (based on *Herpestis humifusa* Griseb.), the only original species.

A single species, *Bacopa humifusa* (Grisebach) Robinson, of Cuba, a prostrate plant of wet soil and remarkable for its salverform violet-blue corolla.

ON TWO COLLECTIONS OF BIRDS FROM THE SOUTHERN SHAN STATES, BURMA

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The present report is based on two collections of birds from the state of Keng Tung in the Southern Shan States, extreme southeastern Burma.

The first collection was made by me during a week's stay in February 1933, assisted by Siamese collectors. The second, during March and April, 1935, was secured by Layang Gaddi, who was with me on the first trip.

Although the 1933 collection was included in a report on Siamese birds in 1934 (Proc. A.N.S.P., 86, pp. 165-280) the species not secured on the second trip are again listed here, together with the 1935 collections. This is done for the sake of completeness, and because the Academy has received much new and useful comparative material since 1934, mostly from western China (the Brooke Dolan collections) and a certain amount from Burma. All the specimens secured in 1933 have been reexamined and when corrections in identification have been found necessary these corrections have been made. Neither collection is a large one; a total of 176 species was secured.

The fauna of this southeastern corner of the Southern Shan States is ornithologically not very well known. It is a most interesting region and proves to be, not unexpectedly, the meeting ground of many forms recorded from Yunnan, Siam and French Indo-China.

The following are recorded from Burma, I believe for the first time:

<i>Coracina novaehollandiae rex-pineti</i>	<i>Stachyris nigriceps yunnanensis</i>
<i>Sitta europaea montium</i>	<i>Mixornis gularis lutescens</i>
<i>Garrulax pectoralis ? robini</i>	<i>Seicercus burkii distinctus</i>
<i>Garrulax monileger schauenseei</i>	<i>Orthotomus sutorius inexpectatus</i>

Others, which according to the Fauna of British India (2nd. ed.) are said to inhabit only Tenasserim or Karenni, are shown to extend to the eastern corner of the Southern Shan States.

Described as new are:

Garrulax erythrocephalus shanus
Abrornis superciliaris contii

A list of the localities, and the position of each, follows.

List of Localities

KENG TUNG.—The capital of the State of Keng Tung. It can be found on almost any map (about long. $99^{\circ} 40'$ E., lat. $21^{\circ} 15'$ N.). The town is situated on a broad plain. Magpies are quite common there. (1933-1935.)

KYU LOI.—A mountain about 20 miles west of Keng Tung (about 7000 ft.). The lower slopes, where we did not collect, are dry and grass covered, but the top is covered by a dense and wet cloud forest. In it is found a mass of babblers, and wren-like birds (*Pnoepyga*, *Spelaeornis*) were not uncommon. It is a superb locality for birds. (1933.)

LOI MWE.—A mountain (?5600 ft.) about 15 miles southwest of Keng Tung, on which is a fort and military post. The lower slopes are covered with dry forest and higher up there must be little evergreen, judging from collections secured by Layang. (1935.)

MENG PEK.—In the lowlands near Keng Tung. (1935.)

MONG LIN.—A village 8 miles west of the Me Kong, about 30 miles north of the Siamese border. It is surrounded by hills, and much bamboo grows in the immediate vicinity of the village. (1933.)

PANG HSIAN.—A rest house about 18 miles west of Keng Tung at the eastern base of Kyu Loi. In front of it flows a small stream. There is no forest immediately near it, the country being clothed by dry, scrubby vegetation. (1933.)

SOP LAO.—A rest house on the fast-flowing Nam Luang, a small tributary of the Me Kong. The surrounding country is hilly, for the most part clothed with tall forest, but on the hills above the stream are numerous clearings of Kaws and other natives. Between Sop Lao and Loi Mwe pine trees are frequently encountered, here growing at a much lower altitude than I have seen them growing in Siam. (1933.)

Annotated List of Species

In the following list, names of birds in square brackets refer to those secured on the first trip but not on the second one.

All measurements are given in millimeters, the wings measured flat against the ruler. The exposed culmen is measured, unless otherwise stated.

No field notes are given, as Layang sent me none, and the first trip was too hurried to allow for much observation.

I take this opportunity to thank the authorities of the Chicago Museum of Natural History, the American Museum of Natural History, New York,

and the United States National Museum, Washington, for their kindness in lending me comparative material which has been most useful in the preparation of this paper.

[*Podiceps ruficollis poggei* (Reichenow)]

Accipiter trivirgatus indicus (Hodgson)

♀ ad., Loi Mwe, February 23.

Accipiter virgatus affinis Hodgson

♀ ad., Loi Mwe, February 23.

Spilornis cheela ricketti Sclater

♂, Loi Mwe (5600 ft.), February 21.

This specimen is larger and much paler, more ashy, than our specimens of *burmanicus* from northern Siam. Its wing measures 481 mm.

Bambusicola fytchii subspecies

♂, Loi Mwe (5600 ft.), March 4.

Mayr believes *oleagina* Bangs and Phillips to be a recognizable race, and records it from southeastern Yunnan and northern Indo-China. We have no material, other than a series from northern Siam, for comparison, but they all most probably are referable to *oleagina*.

The soft parts are recorded as "eyes reddish brown; beak black; legs dark green".

[*Gallus gallus gallus* (Linnaeus)]

In having a well developed comb and long neck hackles, a male from Sop Lao agrees with birds from northwestern Siam and not with a male from Muong Moun, Tonkin.

[*Amaurornis phoenicurus chinensis* (Boddaert)]

Hydrophasianus chirurgus (Scopoli)

♂, Meng Pek, March 1.

Lobivanellus indicus atronuchalis Jerdon

♀, Loi Mwe, March 8.

Tringa glareola Linnaeus

♀, Meng Pek, March 23.

Tringa ochrophus Linnaeus

♂, Keng Tung, March 16.

Capella stenura (Bonaparte)

♂, Loi Mwe, March 6.

Cuculus sparveroides sparveroides Vigors

♀, Keng Tung, March 15.

Rhopodytes tristis saliens Mayr

♀, Loi Mwe, February 15.

[*Centropus sinensis intermedius* (Hume)]

A female from Mong Lin has a wing of 217 mm. which places it under this form, according to Stresemann's measurements (Novit. Zool., 20, 1913).

Glaucidium cuculoides rufescens Baker

♂, Meng Pek, March 26.

This bird is somewhat larger than central Siamese birds, and in color is more rufescent than the average of Siamese birds. The wing measures 154 mm. A female from Chieng Sen is very close to this bird in color and has a wing of 155 mm. It appears referable to this race.

[*Harpactes oreskios stellae* Deignan]

For remarks on this form see these Proceedings, page 25.

Nyctiornis athertoni (Jardine and Selby)

♂, Meng Pek, April 1.

In worn plumage, and very blue. In 1933 a Greater Pied Kingfisher (*Ceryle lugubris*) was seen near Sop Lao but was too wary to be collected.

Upupa epops longirostris Jerdon

♂, ♀, Loi Mwe, February 16; ♂, ♀, Meng Pek, March 20.

Megalaima virens virens (Boddaert)

♂, ♀, Loi Mwe, February 10.

These agree with a Siamese series. For a discussion of the races see Mayr (Ibis, p. 489-90, 1941).

Cyanops franklini franklini (Blyth)

Pha Hom Pok birds are *ramsayi* (Walden).

Cyanops asiatica asiatica (Latham)

♂, ♀, Loi Mwe (5600 ft.), February 25-March 4; 3 ♂, 2 ♀, Meng Pek, March 26-April 5.

These birds are, in reality, intermediate between this race and *davisoni*, but closer to the former.

Xantholaema haemacephala indica (Latham)

4 ♂, Meng Pek, March 21-April 1.

[*Picus vittatus eisenhoferi* Gyldenstolpe]

Picus canus hessei Gyldenstolpe

♀, Meng Pek, April 1.

Chrysophlegma flavinucha flavinucha (Gould)

♂, Loi Mwe, February 18.

Birds from extreme north Siam northward appear best referred to the nominate form. For measurements of our series see these Proceedings, page 34.

[*Dryobates major mandarinus* Malherbe]

Our single female from Kyu Loi was described as a new form (*cadwaladeri*).

As Mr. James C. Greenway was working on the Oriental forms of *Dryobates major*, I took the opportunity of sending this specimen to him, for comparison with *mandarinus*, of which we have no specimens. He confirmed my suspicion that there is no character by which a Shan States form can be recognized.

Dryobates atratus (Blyth)

♂, Loi Mwe, February 18.

This bird and twelve males from Siam agree well together. A single male from Mt. Victoria has the crown more orange red than Siamese birds. It was taken May 7, and the plumage is rather worn. Three Siamese males of the above series were taken in July, and are also worn, but the red color of the crown agrees with winter taken Siamese birds, and not with the Mt. Victoria specimen.

Dryobates hardwickei subspecies

♀, Loi Mwe, February 16.

This specimen has been mislaid and at present cannot be found.

Psarismus dalhousiae dalhousiae (Jameson)

2 ♂, Loi Mwe, February 16.

[*Serilophus lunatus* subspecies]

A single male is very much "redder" above than a specimen from Bolovens, and somewhat more so than Chieng Sen examples. It agrees best with an old, foxed specimen from the Thoungyin River, differing only in having the upper tail coverts of a somewhat deeper chestnut.

The Bolovens bird has the crown and upper back gray. Chieng Sen birds are intermediate in color between Chieng Mai birds and the one from Bolovens.

We have no specimens of *elizabethae* for comparison, and I do not know whether the Bolovens bird properly represents that race.

[*Pitta nipalensis* subspecies]

A young female in partially spotted plumage was recorded in 1934 as *Pitta oatesi*. On reexamination I now believe it to belong to *nipalensis* for it has traces of green coming in on the nape.

Hirundo rustica gutturalis Scopoli

3 ♂, Meng Pek, March 22.

Hirundo striolata substriolata Hume

♀, Loi Mwe, February 24.

This is the specimen from the South Shan States referred to by Mayr in his review of the races of this species (*Ibis*, 1941, p. 369).

Pericrocotus flammeus subspecies

A small series from Loi Mwe and Keng Tung are now in Washington where Deignan is working on the forms found in Siam, Burma and Southern China. Keng Tung birds differ from those from Siam by having the central tail feathers black, narrowly edged with red, and by larger size. Siamese birds have the distal third of the outer web of the central tail feathers completely red.

Pericrocotus ethologus cryptus Mayr

2 ♂, Loi Mwe, February 10, 12.

Hemipus picatus capitalis (McClelland)

♀ (=♂), Loi Mwe, February 11.

Quite typical of the brown-backed form.

Tephrodornis gularis vernayi Ticehurst

2 ♀, Loi Mwe, February 15, March 2.

In color these birds resemble specimens from northern and western Siam, but the wings are slightly longer. Seven Siamese females have wings of 112, 113, 114, 116, 116, 117, 120 mm. (115.4 mm. average) as against 123, 124 mm. for the Loi Mwe birds. They perhaps are approaching *latouchei*, of which we have no specimens.

[*Campephaga fimbriata melaschista* (Hodgson)]*Coracina novaehollandiae rex-pineti* Swinhoe

4 ♂, ♀, Loi Mwe, February 12-March 5.

On comparing these birds with a Siamese series it becomes at once apparent that they do not belong to the same form. The wings are longer, and in color they are much darker, the throat and facial area blackish.

I have been able to compare them with four males and three females from Hainan, three males and four females from Formosa, two males from Fukien, a male from Chapa, Tonkin, a large Siamese series, and a pair from the Chinn Hills.

In comparing only fully adult males, that is birds with no trace of barring below, and little or no white edgings to the secondaries and tertials, the following differences in birds from various regions are apparent.

Hainan birds (*larvivora* Hartert) are the darkest, very blackish on the throat and facial area, and the wing is short (4 ♂, wing 168-174 mm.).

In the Formosa bird (*rex-pineti* Swinhoe), unfortunately one only is fully adult, the throat is not quite so black, the rest of the underparts paler, and the wing a trifle longer (175.5 mm.). A fully adult male from Foochow (*mellianus* Stresemann) is slightly darker below than the Formosa bird and the wing measures 171 mm. A bird from Chapa, Tonkin, resembles the Foochow bird in color, but has a longer wing (175 mm.) thus agreeing in size with Formosa birds. The fully adult males from Keng Tung are in color like the bird from Foochow, but are very large (wings 178, 179, 181 mm.).

With the material at hand I would regard Hainan birds as a distinct race, and would call birds from Formosa, southern China, Tonkin and Keng Tung *rex-pineti*, supressing *mellianus*. With large series the latter may prove separable by being slightly darker than *rex-pineti*, and considerably larger but not quite so dark as *larvivora*.

Yen (L'Oiseau, 1934, p. 304) has already suppressed *mellianus*, but I cannot agree with his suggestion that *siamensis* is not recognizable either. Siamese birds, in both sexes, are much paler and purer gray than any of the forms mentioned above, and but very rarely have the throat darker than the rest of the underparts. In size they vary considerably, central Siamese birds averaging smaller than birds from farther north. For example a male from Khao Sabab has a wing of 163 mm., Chanuman 169 mm., Bua Yai 163 mm., Srisawat 170 mm., Chiang Mai 170-178.5 (7 males), Pha Hom Pok, 175 mm. (typical in color of Siamese birds). A male from Dudaw Taung measures no less than 184 mm. The female from Mt. Victoria resembles Siamese females in having an unbarred breast. Its wing measures 178.5 mm.

Bangs and Van Tyne record birds from Mong Moun, Tonkin, as *siamensis* saying that their male (wing 179 mm.) agreed with a pair from Khun Tan, (Field Mus., Zool. 18, 1931, p. 68). The blackness and darkness of the plumage, however, appears to be acquired with age and they do not state whether their bird is fully adult, with no white edges to the primaries. The only Tonkin bird which I have seen certainly is not *siamensis*. Delacour (L'Oiseau, 1940, p. 194) records only *siamensis* from "toute l'Indo-Chine". La Touche however records *rex-pineti* as resident in Yunnan.

Only fully adult males should be compared for color differences. Young males from Formosa and Hainan are paler than adults and are hard to distinguish in color from mature Siamese birds. In our series from the latter country young birds are paler gray than old ones. This is true in both sexes, and of all the races examined.

For Siamese material I have examined 19 males and 9 females, from Khao Sabab, Kulu, Chanuman, Bua Yai, Kon Ken, Wat Pa, Me Rampan, Srisawat, Khun Tan, Chieng Mai and Pha Hom Pok.

I am much obliged to Dr. Ernst Mayr of the American Museum of Natural History, New York, for kindly lending me material from Formosa, Hainan, Fukien and Tonkin, regions from which we had no specimens.

Dicrurus leucophaeus subspecies

4 ♂, ♀, o, Loi Mwe (5600 ft.), February 10-March 4.

These specimens have been lent to another museum with the rest of our oriental material of this species and are at present unavailable.

Oriolus chinensis tenuirostris Blyth

5 ♂, Loi Mwe, February 9-26.

Oriolus traillii traillii (Vigors)

3 ♂, 4 ♀, Loi Mwe (5600 ft.), February 13-27.

Pica pica sericea Gould

2 ♂, ♀, Keng Tung, March 15.

These three birds and an additional pair secured at Keng Tung in 1933 agree with a large Chinese series.

The species seemed to be relatively common on the plain to the south of the town.

Garrulus glandarius leucotis Hume

3 ♂, 2 ♀, Loi Mwe, February 16-March 6.

These birds agree with Siamese skins. Baker's maximum wing measurement seems too small. He gives for it 177 mm. but the Loi Mwe males measure 181-186 mm., and Siamese males run up to 187 mm.

Urocissa erythrorhyncha erythrorhyncha (Boddaert)

♂, Meng Pek, March 28.

In color, large bluish-white nape patch, violet-blue back, this bird is indistinguishable from a Chinese series. The bill, however, is somewhat larger, more as in *magnirostris*. Baker included this form in the Indian fauna on the basis of a bird from the Southern Shan States saying in part, "...perhaps from the extreme east, seems referable to this form". This specimen confirms his supposition.

Birds from Tsaupo, Chengwei and Muli, Szechwan should belong to *alticola* Bircckhead, but if they are correctly sexed they seem not much larger than east China specimens. They have wings of ♂ 189, 190, 194, ♀ (?=♂) 201 mm. The bills from the anterior edge of the nostril measure, ♂, 21, 24.5, 24.5, ♀, 24 mm. A pair from Chihli have wings of ♂, 193.5, ♀, 181, a male from Kiangsu (probably a female) 180, a male from

Chekiang, 192 mm. The bills in the order given above measure 24, 23, 24, 24 mm. The male from Meng Pek has a wing of 186 and a bill of 26 mm.

***Crypsirina formosae himalayensis* (Blyth)**

♂, ♀, Loi Mwe, February 22.

This pair seems best referred to this race. The black frontal patch is more extensive than in most Siamese skins but the underparts are purer gray than in a series from Chieng Mai and Chieng Dao. They also are a trifle larger.

The only Siamese record is based on a single (? wandering) example from Doi Suteb (Deignan).

The difference between the two series is not very marked, and these birds are probably not typical of *himalayensis*, although near that form.

PARADOXORNITHIDAE

[*Paradoxornis davidiana thompsoni* Bingham]

***Paradoxornis gularis laotiana* (Delacour)**

2 ♂, ♀, 2 ♂, Loi Mwe (5500 ft.), February 12-22.

These five birds and two from Pha Hom Pok, differ from a series of 17 examples from Doi Suteb in having the underparts white, not tinged with buff on the chest. The two series are seasonally comparable.

Five birds from Chekiang, China, (*fohkiensis*) have heavier bills, but as they were taken in July, the plumage is too worn to be able to distinguish any color differences (c. f. Delacour and Greenway, L'Oiseau, 1940, p. 54, and Mayr, Ibis, 1940, p. 711).

PARIDAE

***Parus major nubicolus* de Schauensee**

8 ♂, 3 ♀, ♂, Loi Mwe (5500 ft.), February 2-25.

This newly described form is very similar to *artatus*, but has a shorter wing and tail, and the green carried farther down the back. We also have specimens from Keng Tung.

[*Sylviparus modestus modestus* Burton]

Mayr (Ibis, 1940, p. 702) has shown that *saturation* is best not recognized.

***Aegithaliscus concinnus pulchellus* Rippon**

♂, ♀, Loi Mwe (5500 ft.), February 11.

These two have been compared with examples of *manipurensis*, *talifuensis*, *concinnus* and *iredalei*. Although Baker (Fauna of Brit. Ind., I, p. 93) says that both *pulchellus* and *talifuensis* have the "supercilium all black" our specimens of both these forms have a certain amount of white in the

supercilium, but not to the extent found in *manipurensis*. We have no *pulchellus* for comparison but these birds agree with Baker's description of that form. *Tonkinensis* is apparently a synonym of *talifuensis* (Mayr, Ibis, 1940, p. 704).

Sitta magna magna Wardlaw Ramsey

♂, Loi Mwe, February 25.

Sitta europaea montium La Touche

7 ♂, ♀, 0, Loi Mwe, February 9-27.

These birds agree with a series of 16 birds from the mountains of northern Siam which Deignan identifies as belonging to *montium*.

Four birds from Mt. Victoria (*nagaensis*) are distinctly grayer below, not nearly so buffy as the Loi Mwe birds.

I do not believe this form has been recorded from Burma before.

Sitta frontalis corallina Hodgson

♂, Loi Mwe, February 21.

Certhia discolor shanensis Baker

♂, Loi Mwe, February 25.

Siamese birds agree with this specimen.

[*Aegithina tiphia tiphia* (Linnaeus)]

Chloropsis hardwickii hardwickii Jardine and Selby

♂, ♀, ♀ imm., Loi Mwe, February 11-March 4.

The wings of the adults measure, ♂, 94, ♀ 88.

[*Spizixos canifrons ingrami* Bangs and Phillips]

For remarks on the validity of this form see Proc. A.N.S.P., p. 52, 1946.

Pycnonotus dispar flaviventris (Tickell)

3 ♂, ♀, Loi Mwe, February 11-26.

These birds are a trifle duller and more bronzy below than a series from northern Siam.

Pycnonotus jocosus erythrotis Bonaparte

♂, Meng Pek, March 9.

Pycnonotus cafer chrysorrhoides (Lafresnaye)

7 ♂, 4 ♀, Loi Mwe, February 11-March 20.

These birds are distinctly larger than Siamese birds with the exception of those from Chieng Sen, Chieng Rai, and Ban Cheong. The bills run 15.5 to 18 and the wings in males 95 to 101 mm. Birds from northwestern Siam have bills of 13.5 to 14 and wings up to 92 in males.

The birds from extreme northeastern Siam measure as follows: bills, ♂, Chieng Sen 16, ♂ Ban Cheong 15, Chieng Rai 15.5, wings in the order given above measure 95, 91.5, 95 mm.

The Keng Tung birds have been compared with a female from Lai Chau, Tonkin, a male from Niugai, Yunnan and two old specimens from China. They agree in size with these birds.

[*Pycnonotus striatus paulus* (Bangs and Phillips)]

A series from Pha Hom Pok, and Chieng Mai, and a single specimen from Kyu Loi appear darker on the mantle than four birds from Mt. Victoria. The latter, however, were taken in May while my series are winter birds which may account for the difference. In any case *paulus* appears to differ from Himalayan birds by being smaller.

[*Criniger tephrogenys henrici* Oustalet]

[*Microscelis charlottae propinquus* (Oustalet)]

Microscelis flava hildebrandti (Hume)

2 ♂, Loi Mwe, February 12, March 4.

These birds agree with a northern Siamese series.

Microscelis madagascariensis concolor (Blyth)

10 ♂, 4 ♀, Loi Mwe (5600 ft.), February 22-March 4.

Microscelis madagascariensis leucothorax Mayr

3 ♂, ♀, Loi Mwe (5600 ft.), February 14-March 1.

[*Pteruthius melanotis melanotis* Hodgson]

Pteruthius aenobarbus intermedius Hume

♂, Loi Mwe, February 17.

This specimen agrees with examples from northwestern Siam.

Pteruthius erythropterus aeralatus Blyth

6 ♂, 2 ♀, Loi Mwe, February 18-March 4.

These birds show an approach to *ricketti* in having the gray of the lower parts somewhat darker than birds from northern Siam. Three adult males have solid black ear-coverts while the fourth adult has the black of the ear-coverts mixed with gray. Doi Pha Hom Pok birds are like those from Chieng Mai.

[*Mesia argentauris galbana* Mayr and Greenway]

Liocichla ripponi (Oates)

♂, Loi Mwe (5500 ft.), February 13.

A series from Pha Hom Pok agrees exactly with this bird.

[*Garrulax milnei sharpei* (Rippon)]

A single male from Kyu Loi (6000 ft.) differs from a series of 13 birds from Pha Hom Pok by having the crown and hind neck of a deeper shade of orange-rufous. According to Yen, however, the coloration of the head in a series from Yao Shan (*sinianus*) is very variable (L'Oiseau, 1934, p. 25).

[*Garrulax erythrocephalus shanus* new subspecies]

TYPE.—♀ ad., A.N.S.P. no. 112201, collected on Kyu Loi (6000 ft.), Keng Tung, Southern Shan States, Burma, on February 17, 1933 by R. Meyer de Schauensee.

Description.—Nearest to *G. e. schistaceus* Deignan of northwestern Siam but differing by having the back paler gray, the tail more yellowish green, the chestnut of the throat brighter, and extending down onto the upper breast, much less black on the chin and throat, and the ear-coverts lavender-gray, not silvery gray.

Differs from *G. e. melanostigma* Blyth by having the upper surface gray instead of grayish olive, the edges of the primaries golden olive instead of olive, the tail much more yellowish green and the under surface gray instead of olive-brown.

Differs from *G. e. subconnectens* Deignan of Doi Phu Kha, northeastern Siam, by having the back gray instead of green, the lower surface gray instead of olive-brown, and by not having pale edges to the feathers of the breast.

Differs from *G. e. connectens* Delacour of Indo-China by lacking the squamations on the breast, by having the rufous of the throat darker, by having the mantle grayer and paler and by having the primary coverts black instead of green.

Measurements of type.—Wing 105, tail 114, culmen 19 mm.

Soft parts of type.—"Iris dark purplish red; skin about eye gray; beak black; feet and legs wood-brown; nails gray."

Range.—Known only from Kyu Loi (6000 ft.), about 20 miles west of Keng Tung, Southern Shan States.

Specimens examined.—*Garrulax erythrocephalum erythrocephalum*, INDIA: ♂, ♀, Kulu Kulu, Punjab, (November, December, 1932); 4 o, "Himalayas," (old skins).

G. e. chrysopterum, INDIA: o, Khasia Hills, (old skin).

G. e. nigrimentum, INDIA: ♀, 3 o, "Himalayas," (old skins).

G. e. forresti, YUNNAN: o, Hsienpienho, near Burma line, (January, 1932).

G. e. erythrolaema, BURMA: 3 ♂, 2 ♀, Mt. Victoria, 2600 m., (April, 1938).

G. e. shanus, BURMA: 2 ♀, Kyu Loi, 6000 ft., Southern Shan States, (February, 1933).

G. e. connectens, INDO-CHINA: 7 ♂, 11 ♀, 3 o, Chapa,¹ Tonkin, (November-December-February, 1929); ♂, ♀, Lieng San,¹ 1500 m., Tonkin, (April, 1929); 2 ♂, ♀, 3 o, Lo-qui-ho,¹ Tonkin, (November, 1929).

¹ Chicago Museum of Natural History.

G. e. schistaceus, SIAM: 11 ♂, 5 ♀, Doi Pha Hom Pok, 6400 ft., January-February, 1938).

G. e. subconnectens, SIAM: ♂ (type), ? ♂, ♀, Doi Phu Ka,² 4500-5500 ft., (April, 1936).

G. e. melanostigma > *schistacea*, SIAM: ♂, Doi Suteb,² 5500 ft., (December, 1926); ♂, ♀, Doi Ang Ka,² 6500-7500 ft., (December, 1928).

G. e. melanostigma, TENASSERIM: 2 ♂, Moolau,³ (February, 1892).

G. e. ramsayi, TENASSERIM: ♂, Mt. Nwalabo,² 3000 ft., (May, 1918) ⁴.

G. e. peninsulae, MALAY STATES: Gunong Tahan, Perak, (October, 1891).

Remarks.—Among my series of *schistacea* is one (A.N.S.P. no. 131112) on the label of which Deignan has noted "very like the type of *schistacea*; compared by H.G.D."

The primary coverts in *shanus* are black as in *subconnectens* but of course it does not have the light edges to the breast feathers as in that form or *connectens*.

Connectens is extremely variable in color, some specimens being quite gray below, others very rufescent. Some approach *subconnectens* very closely in general coloration, but the latter may always (as far as my material shows) be distinguished by its black primary coverts.

Rothschild's *forresti* is apparently very close to *woodi*, a form which I have not seen. (See Ticehurst, Ibis 1935, p. 44.) *Woodi* therefore must be very unlike *shanus*. The breast and abdomen in *forresti* are dark vinaceous chestnut, the feathers of the breast centered with black as in *erythrolaema*, and the extreme upper back only is spotted with black. The fore-crown has the feathers centered with black and the forehead is grayish.

This seems to be an extraordinarily plastic species, breaking up into innumerable subspecies throughout its range. In 1934 these specimens were referred to *melanostigma*, but new material has shown them to be distinct from that form.

Garrulax sannio (Swinhoe)

♂, 2 ♀, Loi Mwe (5500 ft.), February 11- March 4.

We have six specimens from Szechwan and Kham, but only one is in comparable plumage. It is from Muli, Szechwan, taken December 5. The others are all worn summer birds.

² United States National Museum.

³ I have been unable to find Moolau on any map but it may well be a variant of Muleyit. "Yit" means mountain and Muli, Moole and Moule are other spellings for the name of this mountain.

⁴ Specimen identified by Dr. Ticehurst with the note "quite out of its range".

The Muli male does not differ in color from the Loi Mwe specimens, but it is slightly larger. It measures as follows: wing, 107, tail 120.5, culmen 20 mm.; Loi Mwe ♂, wing 98, 99, tail 105, 105.5, culmen 19, 19, ♀, wing 92, tail 98, culmen 18.

The Kham specimens (Chong-tu) are too abraded for accurate measurements.

[*Garrulax squamatus* Gould]

A male from Kyu Loi (6000 ft.), differs slightly from a male from Mt. Victoria (the only other specimen in our collection), by having the throat and chest grayer, the chestnut terminal edge of the tail about twice as wide.

Garrulax chinensis chinensis (Scopoli)

♂, Meng Pek, March 8.

This specimen is slightly more olivaceous above, and has the gray of the pileum carried down onto the hind neck more than in 6 specimens from Chieng Rai and Pha Hom Pok. Birds from north Siam have been described as *lochmius* Deignan. I have not seen Chinese birds but record this specimen as *chinensis* because birds from northern Laos are placed there by Delacour, and my example differs slightly from Siamese birds.

[*Garrulax leucolophus diardi* (Lesson)]

Garrulax pectoralis robini Delacour

♀, Loi Mwe (5600 ft.), March 5.

Smaller and more intensely colored than Siamese examples of *meridionalis* and with a wider and more solid pectoral band. It agrees closely with the description of *robini* from Tonkin and Laos.

Berlioz (L'Oiseau, p. 131) regards *robini* as doubtfully separable from *picticollis*. My specimen agrees with the plate of *robini* in having no gray on the sides of the neck.

The Loi Mwe female measures wing 141, tail 130, culmen 28 mm., as against wing 149, tail 137, culmen 24 mm., for a female *picticollis* from Mokanshan, Chekiang. Delacour's measurements for *robini* are ♂, wing 130, tail 142, culmen 24 mm. The specimen is tentatively referred to this form as it has not been compared with specimen from Tonkin or Laos.

Our specimen of *picticollis* is very worn having been taken in August and no color comparison is possible, other than it has gray sides of the neck and the Loi Mwe specimen does not.

Garrulax monileger schauenseei Delacour and Greenway

♂, Loi Mwe, March 5.

Described from northern Laos this deeply colored form is recorded from Burma for the first time.

Garrulax strepitans strepitans Blyth

2 ♂, Loi Mwe, February 18.

These two specimens agree with a large Siamese series. Baker records *strepitans* only from Tenasserim and Siam.

One might expect these birds to be *varenni* Delacour which is said to differ from the typical form by having more white on the sides of the neck. In a series of 22 Siamese birds this character is very variable, as for that matter is the color of the underparts and crown. Measurements given by Delacour (♂ ♂, 125-134 mm.) are no longer than our Siamese birds, in fact Siamese males have wings varying between 126-138 mm. I have not had Tenasserim examples for comparison but Siamese birds have always been referred to the nominate form, and as these do not differ from them I have recorded them as above.

Actinodura egertoni ramsayi Walden

Two females from Kyu Loi have been compared with a series from Pha Hom Pok (*ramsayi*) and a pair from Loukouchai, Yunnan (*yunnanensis* Bangs and Phillips). They are exactly like the Pha Hom Pok series and show no approach to *yunnanensis*.

[Heterophasia picaoides cana (Riley)]

Two males from Kyu Loi agree with a Siamese series.

Leioptila capistrata melanoleuca (Blyth)

3 ♂, 3 ♀, Loi Mwe, February 16-March 1.

In no way different from a Siamese series (c. f. Ticehurst, Journ. Bombay Nat. Hist. Soc. XLI. p. 582, 1940).

[Leioptila annectens annectens Blyth]**Siva castaneiceps** subspecies

♂, Loi Mwe, February 26.

The skin is in poor condition. It is similar in size to Siamese birds (*striata*) but appears to lack the white shaft streaks on the crown. The back is too gray for it to be *torqueola*.

[Siva flavicollis rouxi x rogersi]

Four specimens from Kyu Loi were previously recorded as *harterti* Harington.

In 1937 Deignan described *rogersi* from northeastern Siam and in examining series of the various known forms involved identified my specimens as above.

Birds from Mt. Victoria hardly differ at all from Kyu Loi birds while a single specimen from the Schweli river (Lemgkiang, Yunnan) has a much deeper rufous collar and more rufescent, less olive upper parts and flanks. I have seen no topotypes of *rouxi*, but this bird agrees with Harington's description of *harterti*.

[*Erpornis xantholeuca xantholeuca* Hodgson]

A winter specimen from Mong Lin is not so yellow-green above as two July birds from Mt. Victoria. Perhaps it should be referred to *tyrranula* of which we have no specimens.

[*Alcippe castaneiceps castaneiceps* (Hodgson)]

Two males from Kyu Loi and another male from Doi Suteb agree with four specimens from Mt. Victoria. Of the latter Stresemann remarked (Mit. Zool. Mus. Berlin, 24, p. 199, 1940) that they were indistinguishable from a series from Sikkim. His birds and mine were all collected between 1933 and 1939 and are therefore comparably fresh.

We have two old Himalayan specimens and these differ from fresh specimens by having the flanks ochraceous-buff instead of olivaceous, and the backs very rufescent (c. f. Deignan, Bull. 186, U. S. Nat. Mus., p. 374, 1945).

[*Alcippe morrisonia fratercula* Rippon]

A female from Mong Lin (wing 66) is more tawny below than a series of birds from north Siam, and has the crown and nape darker, thus agreeing best with the description of this form. Mayr has compared our Siamese series with birds from Laos (*laotiana* Delacour) with which he found them to agree. (Ibis, 1941, p. 74.)

Alcippe dubia mandellii (Godwin-Austin)

♂, ♀, Loi Mwe, February 18, 19.

These two birds agree with five specimens from Mt. Victoria (1938) and not with three examples of *genestieri* from Baurong, Szechwan (1931).

Delacour records the latter from northeastern Tonkin and upper Laos, but the Loi Mwe birds are certainly closer to *mandellii*. Our specimens of *genestieri* have wings of, ♂, 62.5, 63, 64, as against the male from Loi Mwe of 58.5 and Mount Victoria males of 59, 59, 60 mm. In addition the crown of *genestieri* is duller than in *mandellii*. Mayr describes the crown of *intermedia*, which I have not seen, as even more olive than in *genestieri* (Ibis, 1941, p. 76). *Intermedia* is the form recorded by Ticehurst for the Southern Shan States (Journ. Bom. Nat. Hist. Soc., XLI, 1940, p. 582) but the crown of my bird is very rufous. I have compared my two specimens with three of *genestieri* from Baurong, Szechwan (1931) and five *mandellii* from Mt. Victoria (1938).

Pellorneum ruficeps subspecies

♀, Loi Mwe, March 1.

In addition to this bird we have two from Mong Lin which agree with it. These birds are not like those from northern and eastern Siam which are usually referred to *vividum*. They are larger, with coarser spotting on the breast, the feathers on the hind neck are blackish, and those on the sides

of the neck broadly edged with buff. From two rather old examples of *mandellii* from Margherita they differ by being less buffy below and more olive above, the latter difference is probably due to foxing of the Margherita skins which were collected in 1902 and 1905. From a specimen from Mt. Victoria (identified by Stresemann as *minus*) these birds differ by being larger, much more coarsely spotted below and the crown and mantle are somewhat paler. Mayr's description of two males from northern Burma (similar to *pectoralis* but paler below with heavier spotting) sounds rather like my birds (Ibis, 1940, p. 69).

Pellorneum albiventris cinnamomeum (Rippon)

A Siamese male is somewhat more olivaceous above, particularly on the wings, rump and tail than a male from Kyu Loi (6000 ft.).

[**Stachyris nigriceps yunnanensis** La Touche]

A single male from Mong Lin agrees with specimens from northern Siam by having a solidly ashy gray throat and the feathers of the pileum black edged with white. A single female of *davisoni* from Trang has the feathers of the pileum brownish black edged with white.

[**Mixornis gularis lutescens** Delacour]

From Mong Lin, 8 miles to the west of the Me Kong River.

Pomatorhinus erythrogenys subspecies

♂ juv., Loi Mwe, March 4.

This bird is too young for subspecific identification. It may belong to *celatus* Deignan described from northern Siam, or *odiscus* Bangs and Phillips of which *minor* Delacour is a synonym.

[**Pomatorhinus ferruginosus albogularis** Blyth]

As Deignan has pointed out *mariae* was described by Walden without comparing it with *albogularis*. As *mariae* came from a point very near the type locality of *albogularis* it is most probably a synonym (U. S. Nat. Mus., Bull. 186, p. 392, 1945).

[**Pomatorhinus schisticeps ripponi** Harington]

Napothera brevicaudata venningi Harington

o, Loi Mwe, February 22.

Compared to two females of *brevicaudata* from Doi Chieng Dao (3000 and 5000 ft.) taken in January, the present bird is duller, less rufous below, and grayer above.

[**Spelaecornis longicaudatus reptatus** Bingham]

These are virtually topotypes of *reptatus* which is an older name than either *sinlumensis* or *kawriensis* Harington. For a discussion of the races of this bird c. f. Mayr, Ibis, 1944, p. 216.

My two birds were obviously a pair, for when I shot them they were hopping together over very moist leaves under tangled growth. One has the throat white (♂), the other the throat rufescent (♀).

[*Pnoepyga pusilla pusilla* Hodgson]

A bird from Kyu Loi which could not be sexed is slightly less rufescent than a fresh series from Mt. Victoria (1938) and perhaps approaches the dark *annamensis*, Robinson and Kloss from Langbian Peaks, Tonkin and Laos.

[*Tesia castaneocoronata castaneocoronata* (Burton)]

A male from Kyu Loi appears to approach the Indo-Chinese form, *abadei* Delacour and Jabouille by having the yellow of the underparts more suffused with olive than a series of five birds from Mt. Victoria, and two old skins from the "Himalayas".

[*Enicurus maculatus guttatus* Gould]

Enicurus schistaceus Hodgson

♂, ♀, Loi Mwe (5600 ft.), February 26.

Myophonus caeruleus caeruleus (Scopoli)

♀, Loi Mwe, February 21.

Myophonus caeruleus eugenei (Hume)

♂, ♀, Loi Mwe (5600 ft.), February 12, March 4.

Other specimens from Kyu Loi, Pang Hsian, and Sop Lao were taken during February.

Myophonus caeruleus temminckii Vigors

♂, ♀, Loi Mwe (5600 ft.), February 26-March 2.

Phoenicurus leucocephalus Vigors

3 ♂, Loi Mwe (5600 ft.), February 22-26.

In size and color there is no difference between these birds, a Pha Hom Pok specimen, a series from Kham, and one bird from Tanna, Kashmir, with which they have been compared.

Saxicola caprata burmanica Baker

♂, ♀, Meng Pek, April 5; ♂, Keng Tung, March 16.

Our Siamese females and the one from Meng Pek support Deignan's statement that continental females are darker and less ruddy, particularly below, than birds of the same sex from the Philippines.

[*Saxicola torquata yunnanensis* La Touche]

The wing of a male from Kyu Loi (6000 ft.) measures 71.5 mm.

[*Kittacincla malabarica* subspecies]

We have but a single female from Keng Tung.

Monticola rufiventris (Jardine and Selby)

♂, 2 ♀, Loi Mwe, February 10-13.

[Monticola solitarius pandoo (Sykes)]**Turdus bouboul bouboul** (Latham)

♀, Loi Mwe, March 2.

Turdus obscurus Gmelin

2 ♂, 3 ♀, Loi Mwe, February 16-27.

Turdus dissimilis Blyth

4 ♂, ♀, Loi Mwe (5600 ft.), February 28-March 5.

Oreocincla dauma dauma Latham

3 ♀, Loi Mwe, February 15-22.

Oreocincla dauma aurea (Holandre)

♀, Loi Mwe, February 11.

Cochoa viridis Hodgson

♂, Loi Mwe (5500 ft.), February 23.

Siphia parva albicilla (Pallas)

♀, Meng Pek, April 4.

Siphia strophciata strophciata Hodgson

6 ♂, ♀, Loi Mwe, (5600 ft.), February 10-March 5.

All these are typical of *strophciata* in coloration.

Siphia strophciata asema Deignan

♂, Kyu Loi (6000 ft.), February 18.

This specimen corresponds to Deignan's description of this "form". It remains to be proved whether it is a color aberration of *strophciata*. According to Delacour and Greenway in Laos, "les individus aberrants a gorge grise ne sont pas rares" (L'Oiseau, 1940, p. 37).

We have a similar male from Pha Hom Pok and another from Doi Suteb, northern Siam. From the latter locality we have seven males typical of *strophciata*.

Siphia hodgsonii Verreaux

9 ♂, 9 ♀, Loi Mwe (5600 ft.), February 10-March 5.

Siphia solitaris leucops (Sharpe)

♂, Loi Mwe (5600 ft.), February 20.

[Cyornis hainana (Ogilvie-Grant)]

♀, Mong Lin, February 13.

Cyornis banyumas whitei Harington

♂, Loi Mwe (5600 ft.), February 20.

Other specimens are from Mong Lin, Me Sai and Sop Lao.

Cyornis unicolor unicolor Blyth

♂, Loi Mwe, February 25.

Eumyias thalassina thalassina (Swainson)

♂, ♀, Loi Mwe (5600 ft.), February 13, 27.

Niltava sundara denotata Bangs and Phillips

♂, Loi Mwe, February 22.

[*Niltava grandis grandis* (Blyth)]

[*Culicicapa ceylonensis percnocara* Oberholser]

[*Chelidorhynchus hypoxantha* Blyth]

[*Rhipidura albicollis albicollis* (Vieillot)]

Hypothymis azurea stayani Hartlaub

♂, Loi Mwe, March 2.

This specimen has a more slender bill than that found in a large Siamese series; otherwise it agrees with Siamese birds.

[*Seicercus burkii tephrocephalus* (Anderson)]

A male from Mong Lin.

Seicercus burkii distinctus La Touche

♂, Meng Pek, April 4.

Easily distinguishable from *tephrocephalus* by having the coronal stripe pure gray bordered laterally by deep black bands; from behind the eye the black bands are broadly edged with pure gray, this color continuing backwards over the ear-coverts.

[*Abroscopus superciliaris contii* new subspecies]

Type.—♀ ad., A.N.S.P. no. 113912, Mong Lin, Southern Shan States, Burma, collected on February 13, 1933 by R. Meyer de Schauensee.

Description.—Closest to *Abroscopus superciliaris superciliaris* Blyth, but back darker with less of a golden wash; throat dingy white instead of pure white. Size slightly larger.

Differs from *flaviventris* Jerdon as exemplified by Mt. Victoria specimens in having the crown ashy gray instead of the forecrown brownish gray and the hind crown olive-yellow; back greener with less of a golden wash; throat patch dingier white and more restricted.

Measurements of type.—Wing 49, tail 40, culmen 8 mm.

Soft parts of type.—"Iris dark brown; feet and legs greenish; upper mandible black, lower mandible blue-gray."

Range.—Known only from the type locality but birds from northern French Indo-China probably belong to this form.

Remarks.—Ticehurst (Journ. Bombay Nat. Hist. Soc., 34, p. 909, 1931), has shown that the correct type locality for the nominate form is Tenasserim and not the Himalayas, restricted to Sikkim (Stuart-Baker). He

further shows that *salwinensis* Baker becomes a synonym of *superciliaris* and that the correct name for the Himalayan bird is *flaviventris* Jerdon.

Specimens examined.—*Abroscopus flaviventris flaviventris*, BURMA: 2 ♂, ? ♂, 2 ♀, Dudaw-Taung (650 meters), Pakokku, Chinn Hills (1938).

Abroscopus f. contii, SOUTHERN SHAN STATES: 2 ♀, Mong Lin (1933).

A. s. superciliaris, SIAM: 2 ♂, 3 ♀, Srisawat, (near the Tenasserim border), (1934); 2 ♂, 2 ♀, Wat Pa (1934).

A. s. schwaneri, SIAM: 2 ♂, Khao Bhanam Bencha, Trang (1936).
SUMATRA: ♂, Blangkajeren; ♀, Deli (1939).

The name is given for Nicolo di Conti, the first European to reach Burma.

[*Abroscopus schisticeps ripponi* Sharpe]

[*Phylloscopus fuscatus fuscatus* (Blyth)]

Phylloscopus pulcher pulcher Blyth

2 ♂, ♀, Loi Mwe, February 10-12.

Phylloscopus inornatus inornatus (Blyth)

2 ♂, Loi Mwe, February 19-March 2; 2 ♂, ♀, Meng Pek, March 19-April 5.

Compared with a series of *mandellii* from Szechwan identified by Dr. Ticehurst.

Phylloscopus proregulus chloronotus (Gray)

2 ♂, Loi Mwe, February 14, 25.

These two agree with a series of *chloronotus* identified by Dr. Ticehurst.

[*Phylloscopus trochiloides plumbeitarsus* Swinhoe]

Phylloscopus reguloides assamensis Hartert

♀, Loi Mwe (5600 ft.), March 2.

The wing measures 56 mm., white edge to outer tail feather about 3 mm.

Phylloscopus davisoni davisoni (Oates)

♂, 2 ♀, Loi Mwe, February 14-19.

Orthotomus sutorius inexpectatus La Touche

♂, Loi Mwe, March 1; 2 ♂, 2 ♀, Meng Pek, March 25-29.

These birds agree with a small series from northern Siam, where, according to Deignan, this race is found.

Two males from Mt. Victoria (*patia*) are brighter green above and the rufous of the crown extends farther back, not changing so conspicuously to olivaceous on the hind crown and nape. Below the buff wash is stronger.

A male from Manhshien, Yunnan, agrees with the Keng Tung birds.

[*Orthotomus atrogularis nitidus* Hume]

Prinia hodgsonii erro Deignan

♀, Meng Pek, April 4.

Cettia squameiceps (Swinhoe)

♂, 3 ♀, Loi Mwe, February 14-March 2.

Anthus hodgsoni hodgsoni Richmond

2 ♂, Loi Mwe (5600 ft.), February 14, March 6.

[*Lanius schach* subspecies]

A male from Kyu Loi combines the characters of both *tricolor* and *schomburgki*. It resembles the former in the color of the mantle and in having the outermost tail feathers pale. It resembles the latter in having the black of the head continued down onto the upper mantle with virtually no gray area separating the black from the rufous of the back and in having a long tail (141 mm.).

Lanius schach nipalensis Hodgson

♂, ♀, Loi Mwe, February 12, 21.

These agree with a series from Kham and western Szechwan.

[*Lanius collurioides collurioides* Lesson]

[*Sturnus malabaricus nemoricola* (Jerdon)]

[*Aethopyga siparaja seheriae* (Tickell)]

Aethopyga gouldiae harrietae Delacour and Greenway

3 ♂ ad., 4 ♂ imm., ♀, Loi Mwe, February 2-March 6.

The three adult males agree with the description of this form in having the red of the breast dark, and continued downward over the upper part of the abdomen.

Delacour and Greenway give the range of this form as northern Laos, Tonkin, southern China, northern Siam and Burma. With this I cannot entirely agree for birds from northwestern Siam (Doi Suteb, Doi Chieng Dao, and Doi Pha Hom Pok) agree with a specimen from Chengwei, Szechwan, in having the scarlet of the breast more flame color and not continued down to the abdomen. That *harrietae* is really separable I doubt, particularly in view of Deignan's statement (U. S. Nat. Mus., Bull. 186, 1945, p. 537) that the form is based in part on material from Doi Angka in northwestern Siam. Certainly none of my eleven adults from northwestern Siam could be called *harrietae*, and if they are, as I believe them to be, inseparable from *dabryi*, then the distribution of the two forms is not very clear.

Aethopyga saturata sanguinepectus Walden

♂, ♀, Loi Mwe, February 20.

In the Shan States we found this bird at much lower elevation (Mong Lin) than in Siam.

Nectarinia jugularis flammaxillaris Blyth

♀, Loi Mwe, April 2.

Nectarinia asiatica intermedia (Hume)

2 ♂, Meng Pek, March 29, April 2.

Arachnothera magna magna (Hodgson)

♂, Loi Mwe, February 20.

[*Dicaeum cruentatum* subspecies]

Three males from Keng Tung and Mong Lin differ from a large series of *siamensis* from eastern and northern Siam by having the sides of the head less blackish, more grayish, the sides of the breast and flanks particularly so. The entire undersurface is much whiter, less strongly tinged with creamy buff. In size they are alike.

We have no comparative material from the north, or from China, but the Keng Tung birds quite clearly are not *siamensis*.

Dicaeum ignipectum ignipectum (Blyth)

♀, Loi Mwe, February 16.

[*Dicaeum concolor olivaceum* Walden]*Zosterops erythropleura* Swinhoe

2 ♂, 5 ♀, Loi Mwe (5600 ft.), February 9-28.

Apparently not rare at Keng Tung, at least in winter.

Zosterops japonica simplex Swinhoe

9 ♂, 10 ♀, Loi Mwe (5600 ft.), February 9-March 5.

[*Zosterops palpebrosa joannae* La Touche]

According to Stresemann this is not a very good race. Four birds from Keng Tung and Sop Lao and Loi Mwe, however, have the flanks slightly grayer than some Siamese examples and the backs slightly less golden and seem referable to this race.

A pair taken at Chieng Mai July 14 and 22 I take to represent *mesoxantha* Salvadori. These two have the flanks only slightly grayish and the dorsal surface considerably more yellowish. This last character may, however, be due to seasonal change.

Passer montanus malaccensis Dubois

♀, Loi Mwe (5600 ft.), February; ♂, 2 ♀, Meng Pek, March 25-27.

These specimens agree with Bangkok and Chieng Mai birds. They have also been compared with a series of *P. m. saturatus* from China.

Passer rutilans intensior Rothschild

♂, Keng Tung, February; ♂, Loi Mwe (5600 ft.), March 2.

These birds agree in color with a winter specimen from the Yangtze Big Bend. They have also been compared with *P. r. lisarum* from Mt. Victoria and *rutilans* from Chekiang.

Ploceus philippinus burmanicus Ticehurst

♂, Keng Tung, March 15.

The bird is acquiring the breeding plumage.

Carduelis ambiguus (Oustalet)

♂, 4 ♀, Loi Mwe (5600 ft.), February 6-March 6.

Carpodacus erythrinus roseatus (Blyth)

2 ♂, Loi Mwe (5600 ft.), February 25, March 2; ♂, Meng Pek, March 21.

Emberiza rutila Pallas

♂, 3 ♀, Keng Tung, March 12-15; ♂, Meng Pek, April 2.

[*Emberiza pusilla* Pallas]

Melophus lathami lathami (Gray)

2 ♂, Keng Tung, March 16; 2 ♂, Meng Pek, March 30.

Note.—In these Proceedings (vol. 98, p. 60) I described a new form of babbler under the name of *Garrulax leucolophus peninsulae*, the type of which is A.N.S.P. no. 130244, collected at Khao Luang, peninsular Siam.

I have just realized that this name is already in use for *Garrulax erythrocephalum peninsulae* (*Trochalopteryx peninsulae* Sharpe, Proc. Zool. Soc. London, 1887, p. 436).

I therefore propose the name of *Garrulax leucolophus peninsularis* nom. nov. (pro *Garrulax leucolophus peninsulae* de Schauensee, Proc. Acad. Nat. Sci. Phila., vol. 98, p. 60, 1946.)

A COLLECTION OF FISHES OBTAINED IN THE RIU KIU ISLANDS
BY CAPTAIN ERNEST R. TINKHAM A.U.S.

BY HENRY W. FOWLER

Curator of Fishes, The Academy of Natural Sciences of Philadelphia.

This interesting collection was sent by Captain Tinkham from Aguni Shima, west of Okinawa in the East China Sea, late in 1945. It is well representative of the off-shore reef species of the main group (Amami Gunto or Nansei Islands) in the Riu Kiu chain. This is well suffused with Philippine forms or their representatives. Altogether the collection consists of 383 specimens, representing 146 species or subspecies. Of these 45 are described as new and 8 as new genera or subgenera. In addition to these novelties the collection reveals a number of species apparently not before reported from the Riu Kiu Islands. These are chiefly of Philippine or East Indian origin and tend greatly to extend their range northward, or establish them properly within Chinese limits, for the Riu Kiu Islands were formerly the Chinese Loo Choo Islands.

We are especially grateful to Captain Tinkham in securing this valued collection for our museum. Captain Tinkham writes: "James J. Hollis, Carpenter's Mate, First Class, was in charge of the native fishermen, and day after day went out on the reefs with the natives. He had the fishermen bring to him all the smaller fish and then brought them to me. The native fishermen wore home-made wooden goggles that fit separately over each eye, the two held together across the bridge of the nose by a short piece of cord. They dived deep into the coral caves and pools for the stunned fish. I went far out on the reefs, one time wearing my combat boots, as the coral would have cut my feet to pieces, yet the natives could walk barefooted on the jagged stuff without injury. Hollis brought me an additional 25 species that I did not have up to that time. That was the day (evidently July 27) I made all the color notes and wrapped the new fish in the netting. So from this account you will see that but for Hollis I surely would not have obtained such a fine series of specimens.

"I spent a lot of time collecting the smaller fish during many afternoons, collecting in the coral pools. I often dug in under the coral rubbish in the bottom of small pools, when the tide was out, and often found some interesting things hiding down in such places waiting for the tide to come in. A very good friend of mine, Captain Byron J. Prugh, spent many hours making a specially designed net with floats to catch the small fish in the coral pools. He also spent several afternoons aiding me in catching these small beautiful

fishes. During the darker days of our fight with the Japanese, our commanding officer, Lieutenant Colonel William J. Herlihy, played a very interesting role in helping to stop the Japanese coming across the Owen Stanley Range from Buna into Port Moresby. He was also at Buna and many other places in the fight along the northeastern shores of New Guinea. Because of his kindly interest in my efforts he deserves remembrance."

A photograph of some of the larger fishes used as food by the natives of Aguni Shima is dated September 2. "These portrayed in the photo are all eaten by the natives, although I don't think I would eat them all, especially the porcupine fish [*Diodon hystrix* Linnaeus]. The large one on the left is a parrot fish [*Scarus*?], but I don't know what the second one from left is [*Pseudupeneus*?]. The one on the right is a unicorn fish [*Naso lituratus* (Bloch)] and you will see the big blunt spine projecting in front of the eyes. The second from the right [probably *Kyphosus lembus* (Cuvier)] is quite a good eating fish, with pure white meat and one of the more common larger fish sought for by the natives."

As the fishes of the Riu Kiu Islands have been well treated by Professor P. J. Schmidt, in his work of the same title with references to the literature, the additional titles follow:

IKEDA, HYOZI

1939. Preliminary notes on the fishes of the genus *Kuhlia* from the Riu Kiu Islands. Zool. Magazine, Tokyo, vol. 51, no. 2, p. 105.

JORDAN, D. S., and TANAKA, SHIGEHIO

1927. The fresh-water fishes of the Riu Kiu Islands. Ann. Carnegie Mus., vol. 17, no. 2, pp. 259 to 278.

KUROIWA, H.

1927. Catalogue of fresh-water fishes collected in Riu Kiu curve, 1912-1925. Zool. Magazine, Tokyo, vol. 39, pp. (467) 354 to 368.

KURONUMA, K.

1939. A misidentified Soleid fish from Okinawa. Zool. Magazine, Tokyo, vol. 51, pp. 783 to 384.

OKADA, YAICHIRO and IKEDA, HYOZI

1937. Notes on the fishes of the Riu Kiu Islands. Bull. Biogeographical Soc. Japan, vol. 7, no. 7, March 1937, pp. 1 to 95, pls. 4 to 6 (photos), 5 text-figs. List of 20 species, 4 described as new.

1938. The freshwater fishes of Okinawa-Zima. Trans. Biogeographical Soc. Japan, vol. 3, no. 1, Feb. 1938, pp. 71 to 89, pls. 2 to 4. A list of 15 species.

1939. The freshwater fishes of Myako-Zima and Adjacent Islands. Op. cit., vol. 3, no. 2, Oct. 1939, pp. 210 to 219, text-fig. 1 (map). Lists 14 species.

OKADA, YAICHIRO and KORA, K.

1935. List of Vertebrates from Okinawa-Honto and the neighbouring islands. Bull. Okinawa Nat. Hist. Soc., vol. 1, no. 1, pp. 3 to 22.

SCHMIDT, P. J.

1930. Fishes of the Riu Kiu Islands. Trans. Pac. Committee Acad. Sci. USSR., no. 1, pp. 19 to 156, pls. 1 to 6.

— A list of fishes of the Riu Kiu Islands, collected by K. Awaya in 1929. Bull. Acad. Sci. Leningrad, 1930, pp. 541 to 558.

— On the fishes of the Riu Kiu Islands. Proc. Fourth Pac. Sci. Congress (Batavia-Bandoeng), vol. 3, 1930, pp. 513 to 517.

— An additional list of the fishes of the Riu Kiu Islands, with description of *Pseudochromichthys riukianus* n. g. n. sp. Trans. Pac. Committee Acad. Sci. USSR., no. 2, 1930, pp. 177 to 185, fig. 1. A list of 24 species.

Owing to their fresh condition when first received, many of the specimens afforded valued color notes. Acknowledgment is also due to Captain Tinkham for a number he made on the spot, at the time the specimens were collected, and these are indicated by quotation marks.

OPHICHTHIDAE

Chlevastes colubrinus (Boddaert)

One, 408 mm., July 27. Thirty transverse black bands and no dark spots in the intervening pale areas.

ECHIDNIDAE

Echidna nebulosa (Ahl)

One, 250 mm., July 27. In color markings it suggests the alternate black blotches shown on the belly in Mitchell's figures 11 and 15, published as *Muraena variegata* by Richardson in 1944. These black blotches in my specimen are, however, extensions from the lower lateral blackish spots on the body and tail.

SYNGNATHIDAE

Corythoichthys flavofasciatus (Rüppell)

Four, 95 to 105 mm., July 27.

HOLOCENTRIDAE

Holotrachys riukuensis new species

Figure 1.

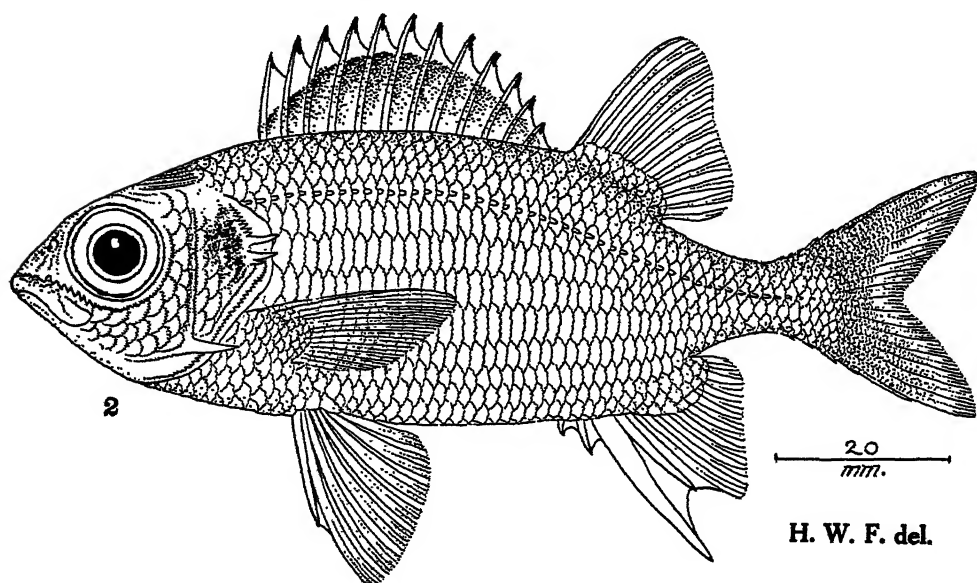
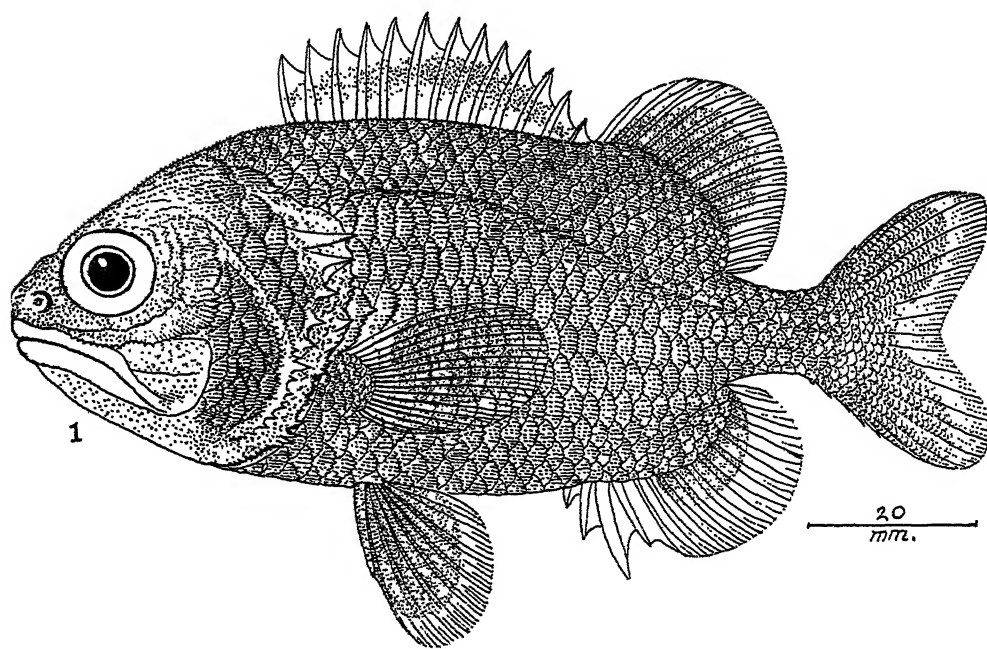
Depth $2\frac{1}{2}$; head $2\frac{1}{3}$, width $1\frac{1}{2}$. Snout (in profile) 6 in head, tip level with lower edge of eye; eye $3\frac{1}{2}$, greater than snout or interorbital; mouth terminal, jaws little inferior from level of front end of snout; maxillary $1\frac{1}{2}$ in head, expansion slightly less than orbit; lips rather broad, fleshy; teeth granular, in moderately broad bands in jaws and finely villiform on vomer and palatines; interorbital narrow, width $1\frac{1}{2}$ in orbital diameter; almost all bones of head and scales denticulated; bony postorbital width $\frac{3}{8}$ in orbit; 2 large opercular spines, lower slightly shorter. Gill opening extends forward nearly opposite front edge of pupil. Gill rakers $7 + 13$, lanceolate, $1\frac{1}{2}$ in eye; gill filaments $\frac{3}{4}$ gill rakers.

Scales $34 + 5$ in lateral line; 5 above to dorsal origin, 8 below to anal origin; 5 rows on cheek. Scales all spinescent; 2 or 3 series along soft dorsal and anal bases. Caudal scaly for about $\frac{1}{2}$ its extent on each lobe. Pectoral base with small scales.

D. XII, I, 15, sixth spine 3 in head, fourth ray $2\frac{2}{3}$; A. IV, 11, third spine $3\frac{1}{3}$, fourth ray $2\frac{1}{3}$; least depth of caudal peduncle $4\frac{1}{3}$; caudal well forked, lobes rounded, length $1\frac{1}{2}$; pectoral $1\frac{1}{2}$, rays I, 15; ventral rays I, 7, spine 2 in fin, which is $1\frac{1}{2}$ in head.

Color when fresh, in alcohol, uniform bright orange red. Borders of all fins more or less white. Iris bright orange red.

A.N.S.P. no. 72002. Aguni Shima, Riu Kiu Islands. July 27. Length 120 mm. Type.



H. W. F. del.

Fig. 1.—*Holotrachys riukuensis* new species.Fig. 2.—*Faremusca lacteoguttata termastigma* new subspecies.

Distinguished from *Holotrachys lima* chiefly by its coloration. Compared with Ford's colored figure, as published by Günther in 1874, the present species differs in the longer pectoral, broader postorbital, larger ventral fin, longer third anal spine, deeper separation of dorsal fins, besides the details of coloration. Scarcely more is afforded by Baldwin's water color figure as published by Jordan and Evermann in 1905.

(Named for the Riu Kiu Islands.)

***Faremusca ittodai* (Jordan and Fowler)**

Color in alcohol brilliant scarlet with 3 longitudinal narrow crimson purple bands, following in scale junctures, along above lateral line and 6 bands below traversing middle of each scale row, with the uppermost broadest and others all gradually narrower. Snout vermilion. Iris crimson. Head with more or less crimson suffusion. Spinous dorsal golden orange, first 2 membranes each with blackish brown median blotch; deep crimson bar starts at base of first membrane then arches up, fading pale gray white to continue as median band on fin and below it bases of membranes bright golden yellow; spines all more or less tinged with crimson. Rayed vertical fins golden orange. Paired fins orange, spine and front edge of ventral crimson. July 27. One, 133 mm.

One, 63 mm. August 7, in pools. This species varies from Hudson's figure of the type, published by Jordan and Fowler as *Holocentrus ittodai*, in having the lower white band on the spinous dorsal much broader but lower posteriorly, and the 2 dark longitudinal bands immediately adjacent much darker to nearly blackish. When freshly received the specimen was brilliant scarlet.

***Faremusca lacteoguttata termastigma* new subspecies**

Figure 2.

Depth $2\frac{3}{4}$; head 3, width $1\frac{1}{4}$. Snout (in profile) $4\frac{1}{2}$ in head, tip level with lower edge of pupil; eye $2\frac{1}{2}$, large, greatly exceeds snout or interorbital, and slightly infringes on upper profile; maxillary reaches below front edge of pupil, length 3 in head; mouth small, closed lower jaw slightly shorter than upper jaw; teeth in villiform bands in jaws and narrow band on each palatine, apparently absent from vomer; interorbital $1\frac{1}{2}$ in eye, well concave; preopercle edge serrated, spine half long as eye; opercular spines 2, subequal. Gill opening large, extends forward opposite middle of eye. Gill rakers iv, 2 + 6, iii, lanceolate, longest $\frac{3}{4}$ of gill filaments, which are $\frac{2}{3}$ of eye.

Scales 43 + 3 in lateral line; 4 above to spinous dorsal origin, 9 below to anal origin; 4 rows on cheek; 6 predorsal. Bases of dorsal and anal scaled. Caudal scaly from base over $\frac{2}{3}$ of lobes. Axillary ventral scale $2\frac{3}{4}$ in spine.

D. XII—12, fifth spine 2 in head, first ray $1\frac{3}{4}$; A. IV, 9, third spine $1\frac{1}{2}$, first ray $1\frac{3}{4}$; least depth of caudal peduncle $3\frac{1}{4}$; caudal forked, upper lobe little longer or slightly less than head; pectoral $1\frac{1}{2}$ in head, rays ii, 13; ventral rays I, 7.

Color when fresh in alcohol with back crimson. Above lateral line 4 longitudinal darker crimson bands traversing the scale junctures, equally wide as the lighter resulting crimson bands extending on the scale exposures

medially. Below lateral line 6 similar darker crimson bands in scale junctures with 5 pale crimson (fading pink or white) bands extended along scale exposures. Upper surface of head crimson. Muzzle scarlet. Cheek and iris crimson. Opercle dark olive and brown. Under surfaces all more or less whitish or pink. First dorsal with outer portion of each membrane yellow, then a blackish brown blotch which is basal on first membrane, but as the series ascends it becomes median and finally basal at last low membrane; below pinkish gray and spines suffused with pink; behind tip of each spine membrane with small blackish brown spot. Rayed vertical fins orange vermillion, more orange marginally. Pale orange on paired fins.

A.N.S.P., no. 72003. Aguni Shima, Riu Kiu Islands. July 27. Length 113 mm. Type.

Distinguished by its coloration from *Faremusca lacteoguttata* (Cuvier), especially the tip of each membrane behind the tip of each dorsal spine black. (τέρμα end + στίγμα spot; with reference to the spinous dorsal.)

Flammeo sammara (Forskål)

Color when fresh in alcohol crimson, with dark longitudinal bands, that along lateral line most pronounced and darkest. Each scale on cheek with a dark spot. Iris crimson. Jaws orange. End of each membrane of spinous dorsal contrasted white, fin otherwise crimson gray, more crimson basally and medially on first 2 membranes large black blotch. Rayed vertical fins orange red, more orange basally; soft dorsal with front border blackish. Anal with fourth spine embraced in blackish band. Each caudal lobe with broad submarginal blackish band. Paired fins orange red. One, 150 mm. July 27.

Myripristis murdjan (Forskål)

Color when fresh in alcohol uniform bright scarlet. Iris red. Black bar along upper border of gill cover and black blotch at opercular angle. Border of spinous dorsal orange. Borders of soft dorsal, anal and caudal all whitish, with ends of fins or lobes slightly dusky submarginally.

Three, 93 to 140 mm. July 27. Largest with central part of each scale exposure with crimson suffusion, otherwise agrees with the above.

MUGILIDAE

Oedalechilus crenilabis (Forskål)

Upper lip broad, entire. Both lips with about 20 minute marginal lapets, each with still smaller papillae; apparently 3 or 4 rows of minute, feeble papillae on submargin of lower lip. Two rows of scales on cheek. Pectoral slightly shorter than head, reaches opposite origin of first dorsal. Scales 37 + 5.

Color in alcohol with back above dark brown, sides pale olive buff with silvery white suffusion and under surfaces more nearly pure white. Iris gray buff. Upper lip and front end of snout broadly blackish brown. Opercles sprinkled with numerous close set dark gray dots. Fins all more or less dark gray brown, though margins and bases of ventrals whitish. Pectoral distinctly dark above, with small black spot at origin and axil dusky. One, 77 mm. July 27.

The above agrees with 2 specimens I reported from Pago Pago, Samoa, in 1917.

SERRANIDAE***Cephalopholis argus* (Schneider)**

One, 163 mm. July 27. Although quite dark to blackish, perhaps due to formaline content in the alcohol, it has the fins all more or less with fine or small dark spots. Edges of rayed vertical fins narrowly whitish. Spots on head broadly numerous, larger on latter and all with dark rings.

***Cephalopholis urodelus* (Schneider)**

Color in alcohol warm dark brown, becoming more or less reddish on breast and abdomen. No spots on body. Dorsals dark brown, fading to pale olive marginally. Caudal blackish medially, with very narrow white edge behind and marked with oblique gray white line sloping toward middle from above and a similar one on lower half of fin reversed. Anal dark reddish brown. Pectoral with broad gamboge border all around, basally and medially dark brown. Ventral dark dusky gamboge. One, 163 mm. July 27.

***Cephalopholis pachycentron* (Valenciennes)**

One, 112, July 27. General appearance blackish, edges of soft dorsal, anal and caudal narrowly whitish. Iris deep brown. Spinous dorsal membranes more or less orange. Head with black spots.

***Serranus merra* (Bloch)**

One, 87 mm., September 5. Two, 81 and 82 mm., July 27. Dark brown spots on body large. Pectoral with 6 rows of black spots.

***Serranus areolatus* (Forskål)**

Color in alcohol brownish generally, scarcely paler below and everywhere with more or less rounded red spots. On back 5 black saddles, first pre-dorsal and others on second dorsal spine and 2 on soft dorsal and adjacent region of back; these blotches slope obliquely forward across body. Large reddish spots over head, even on jaws and all greatly broader than pale interspaces. Large red spot at center of breast, 1 at isthmus, 2 along each edge of gill opening and 1 at base of each ventral. On body 2 rows of reddish spots above lateral line and 5 below on trunk. Iris gray, with red ring around pupil. Spinous dorsal with black spot behind tip of each spine and 2 rows of dark red blotches over greater basal squamous area of fin. Soft dorsal with 3 or 4 irregular rows of red spots; caudal with 5 rows and all spots become smaller terminally on fins; hind caudal edge narrowly white, with blackish submargin below. Pectoral orange or yellowish with 10 rows of moderate close set red spots, contracted fin appearing barred. Ventral with broad blackish band on front part of fin, rest whitish with about 5 rows of spots, which are much smaller terminally on fin. One, 107 mm., July 27.

D. XI, 16; A. III, 8, 1. Five large dark blotches on body reflected on dorsal fin bases. In pale reticulations many small scattered pearly whitish spots on both head and body. Outer row of lesser spots on soft dorsal red, also similar large spots on caudal. Pectoral gamboge or yellowish, with red spots in 7 transverse rows. Ventral whitish, with large gray black blotches. One, 57 mm., July 27.

Grammistes sexlineatus proerythraeus new subspecies

Figure 3.

Depth $2\frac{3}{8}$; head $2\frac{1}{4}$, width $2\frac{1}{4}$. Snout (in profile) $4\frac{1}{2}$ in head as measured from snout tip, which is level with lower edge of pupil; eye large, advanced, very close to upper profile, greatly exceeds snout or interorbital; maxillary very long, extends back very slightly beyond hind edge of eye, expansion $1\frac{1}{2}$ in eye; mouth large, closed lower jaw protruded in front; teeth minute, villiform, in bands in jaws, which narrowed posteriorly and finer teeth in patch on vomer, also narrow band on each palatine; tongue narrow, spatulate in front, interorbital width $1\frac{1}{2}$ in eye, depressed, level; 3 opercular spines, median most posterior; preopercle with 3 short, broad-based spines. Gill opening large, extends forward opposite front edge of eye. Gill rakers $5 + 8$, short, lanceolate, subequal with gill filaments, which are $\frac{2}{3}$ of eye.

Scales present only on trunk and tail, small, very compact and embedded. Head naked. Few scales on pectoral base and apparently little developed on bases of vertical fins. Lateral line complete, arched high on trunk and midway along side of caudal peduncle; tubes large, inconspicuous, about 20 distinct half way in its course.

D. VI, 13, third spine $3\frac{1}{2}$ in total head length, seventh branched ray $2\frac{1}{2}$; A. 10, third branched ray 2; least depth of caudal peduncle $2\frac{9}{10}$; caudal $1\frac{1}{2}$, convex behind; pectoral 2, rays II, 15; ventral I, 5, spine half of fin, which is $2\frac{1}{4}$ in total head length.

Color dark blackish brown generally. Brilliant orange band from snout tip over predorsal region, becoming vermilion at origin of spinous dorsal and over first 2 spines and their membranes same color. Upper longitudinal red band from hind eye edge to bases of upper caudal rays, another parallel from red blotch below hind eye edge to bases of lowermost caudal rays. Orange bar from gill opening to lowermost pectoral rays. Horizontal red line along lower side of belly from between bases of paired fins until above front of anal. Soft vertical fins orange. Pectoral gray. Ventral dark gray.

Color in alcohol later, generally blackish brown, with whitish longitudinal bands on each side of body. Iris gray-black. Median red band on top of head over predorsal and including first 2 dorsal spines and their membranes. Rest of spinous dorsal blackish. Soft dorsal, anal and caudal whitish, with dark diffuse base band on each. Pectoral grayish. Ventral gray black.

A.N.S.P., no. 72004. Aguni Shima, Riu Kiu Islands. July 27. Length 33 mm. Type.

Defined by the scarlet front of the spinous dorsal, which is blackish in *Grammistes sexlineatus* (Thunberg).

($\pi\rho\delta$ before $+$ $\epsilon\rho\theta\epsilon\delta\varsigma$ red; with reference to the spinous dorsal.)

PSEUDOCROMIDAE*Dampieria ocellifera* new species

Figure 4.

Depth 3 to $3\frac{1}{2}$; head 3 to $3\frac{1}{2}$, width 2 to $2\frac{1}{10}$. Snout $3\frac{1}{2}$ to $4\frac{1}{2}$ in head as measured from snout tip, which is level with lower edge of eye; eye $3\frac{1}{2}$ to $3\frac{1}{2}$, greater than snout or interorbital and well elevated; maxillary oblique, reaches opposite front edge of pupil, length $2\frac{2}{3}$ to $2\frac{1}{2}$ in head as measured from snout tip; mouth large, oblique, closed lower jaw protruded in front;

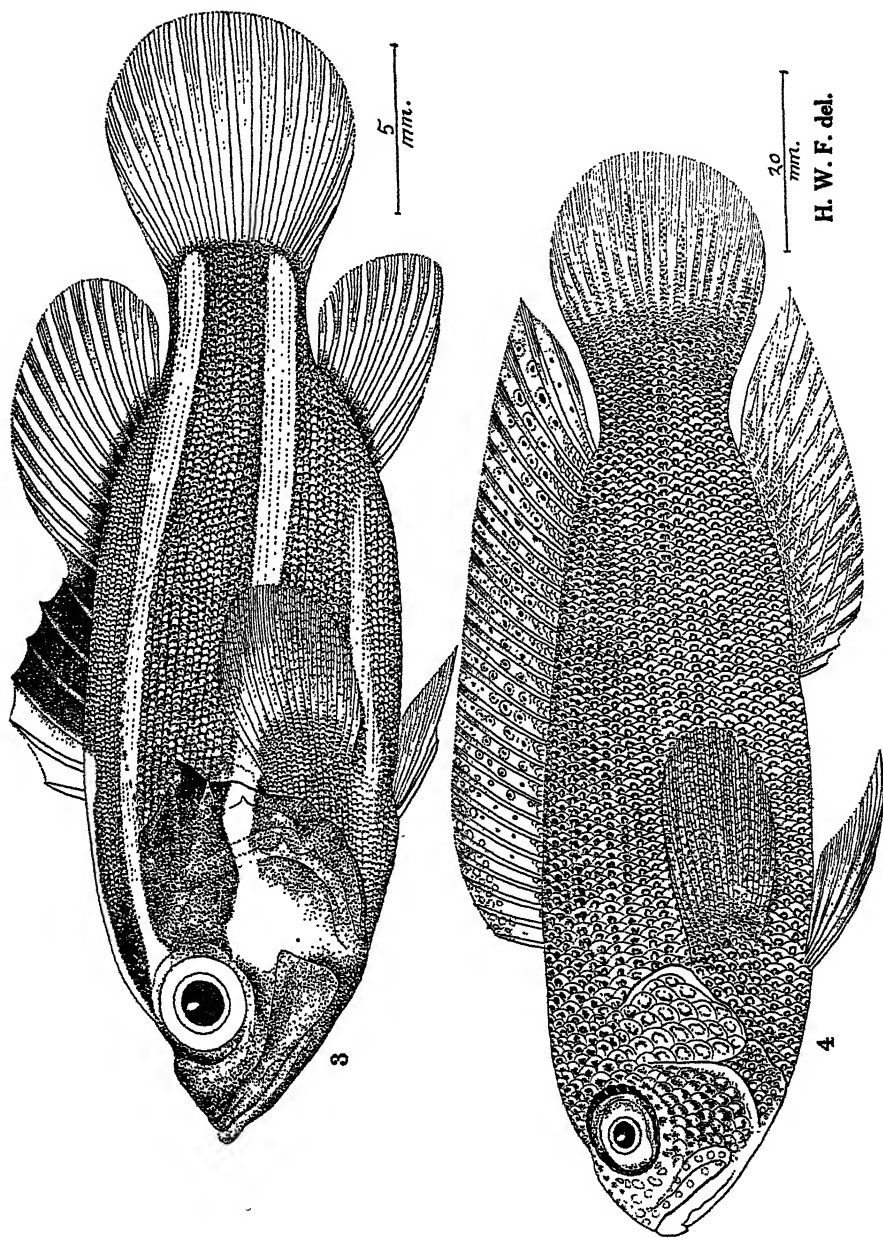


Fig. 3.—*Grammistes sextineatus proerythraeus* new subspecies.

lower lip broader than upper, with broad fold over symphysis of mandible; narrow band of pointed teeth in each jaw, with outer row more or less enlarged, and pair of canines in front of each jaw. and below canine each side medially; band of small teeth across vomer; interorbital $3\frac{3}{4}$ to $4\frac{3}{4}$ in head from snout tip, low, convex; preopercle entire. Gill opening extends forward opposite front pupil edge. Gill rakers $6 + 9$, lanceolate, but short and robust; length $\frac{2}{3}$ of gill filaments, which are 3 in orbit.

Scales 48 to 51 in upper section of lateral line, 13 to 15 + 2 in lower section; 14 between upper section of lateral line and anal origin; 6 rows on cheek below eye. Muzzle naked, head otherwise scaly, with predorsal scales extending forward to middle of interdorsal space. All fin bases more or less finely scaly, even inner faces of ventral bases.

D. IV, 26, 1, first spine 5 to 6 in total head length, fifth ray $1\frac{9}{10}$ to $2\frac{3}{4}$, twenty-fifth ray $1\frac{1}{2}$; A. III, 14, 1, third spine 4, fourth ray 2 to 3, thirteenth ray $1\frac{7}{8}$ to $1\frac{1}{2}$; least depth of caudal peduncle 2 to $2\frac{1}{10}$; caudal $1\frac{1}{10}$ to $1\frac{1}{2}$, convex behind; pectoral $1\frac{1}{10}$ to $1\frac{1}{2}$, rays II, 16; ventral rays I, 5, fin $1\frac{1}{2}$ to $1\frac{1}{2}$ in total head length.

Color of type when fresh in alcohol with head and front part of trunk dark olive brown, and rest of body rich orange crimson, but becoming more or less vermilion at bases of vertical fins. Within limits of dark head and front of trunk many golden spots on maxillary, preopercle, lower side of head, breast and belly. On predorsal and cheeks close set parallel bluish streaks, more or less broken into spots on scales and alternating with dark spots in scale junctures. Within area of orange crimson of body each scale with subdued or indistinct pearly spot. Iris mostly red, with broad blackish bar horizontally above and similar gray or pearly one below, which is delimited by narrow blue horizontal line. Outer or upper portion of dorsal pale or light gray, margin with very narrow dark line against narrow pearly gray submarginal line; anteriorly and partly submarginal on fin some irregular blue spots or short streaks, but not present posteriorly; medianly on fin membranes 4 to 5 dark streaks, variously broken as spots and all more or less pale to whitish (likely blue in life) borders; these so broken posteriorly on the fin that they form small ocelli. Anal pale or light gray, with many pale to whitish well inclined parallel lines (evidently blue in life). Caudal reddish gray, but without distinct pale or dark edge. Pectoral fin golden orange basally. Ventral orange.

A.N.S.P., no. 72005. Aguni Shima, Riu Kiu Islands. July 27. Length 120 mm. Type.

A.N.S.P., nos. 72006 and 72007. Same data. Length 97 to 99 mm. Paratypes.

Color in alcohol largely olivaceous brown, only median part of body, embracing hind part of trunk and fore part of tail, bright scarlet. All scales show dark spots, though these darker and more distinct in dark areas. Entire head more or less flushed with red. Iris crimson. Mandible and lips olive green. Some red and dark brown spots on maxillary. Intermandibular region dark gray. Dorsal gray, scaly region and upper edge of fin red, each membrane with 5 blackish spots, of which lower is larger and upper as little bars tending to form into longitudinal streaks on soft dorsal. Anal gray, with broad red basal band and many whitish lines inclined across fin rays. Caudal gray. Paired fins olive green.

A species largely distinguishable in its color pattern and markings. These may be grouped; as dorsal with 4 to 6 series longitudinally of dark gray small ocelli (evidently blue in life) and bordered with pearly gray; anal with narrow pale (light blue) or pearly lines, about as numerous as rays, but all inclined and sloping across fin rays; dark spots on opercles more or less continuous with series of dark spots at scale junctures of cheek scales, but on the opercular scales they vary large or small according to the size of the scale as they involve most of the scale exposure; many of the larger may have a median small pearly dot.

In structural details the species has the large depressed pectoral reaching $2\frac{2}{3}$ times to the caudal base (right pectoral $2\frac{3}{4}$); scales 5 between lateral lines at end of upper section; scales of head not reaching rim of orbit, so naked strip all around infraorbitals equal to scale width; tip of snout level with lower edge of eye. The above details will serve to distinguish the figures of Speigler, Obbes, and Redzko, as published by Bleeker, Weber and Beaufort, and Schmidt as different.

(*ocellus* a little spot + *fero* to bear.)

PLESIOPIDAE

Plesiops melas Bleeker

Figure 5.

One, 14 mm., July 27.

DULEIDAE

Moronopsis taeniurus (Cuvier)

One, 23 mm., July 26; three, 25 to 60 mm., July 27; two, 22 mm., July 29. Black subterminal blotch on each caudal lobe very extensive or leaving only a very small white tip to each lobe, and the sub-basal black band only extended about half way in each lobe.

Two, 52 to 73 mm., August 7, in pools. Compared with Speigler's figure, published as *Moronopsis taeniurus* by Bleeker, they agree in the black caudal markings except that the median black band extends forward along side of caudal peduncle. The dorsal of my specimens differs in showing the apex of the soft dorsal pale; 2 or 3 incomplete dark slightly inclined longitudinal streaks, following scale junctures above lateral line; below lateral line horizontal streaks made up of a grayish spot on each scale exposure. The smaller of the above specimens seems to differ abnormally in having the median black horizontal band on the caudal fin united at the edge of the fin (on both sides of the fin) with the first inclined black bar on the lower caudal lobe. Eight, 20 to 26 mm., August 2.

APOGONIDAE

Apogon novemfasciatus Cuvier

Five, 14 to 23 mm., July 25; six, 16 to 40 mm., July 27; three, 17 to 31 mm., July 29. The smallest specimens show only 3 black longitudinal bands and in all the black caudal spot is pronounced.

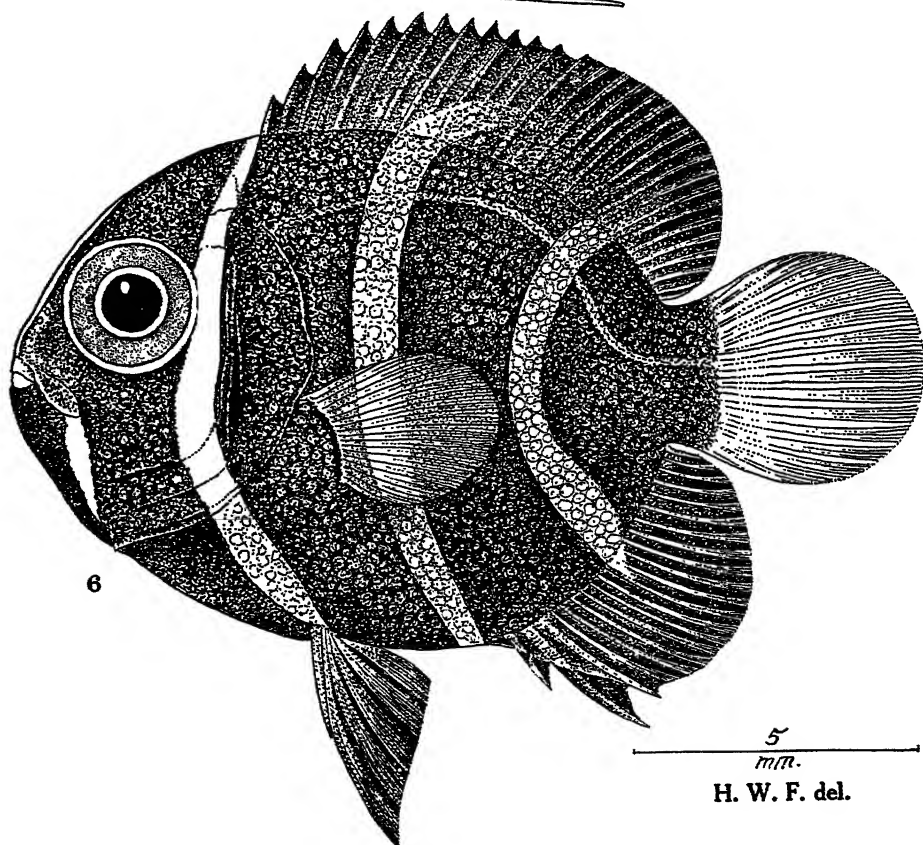
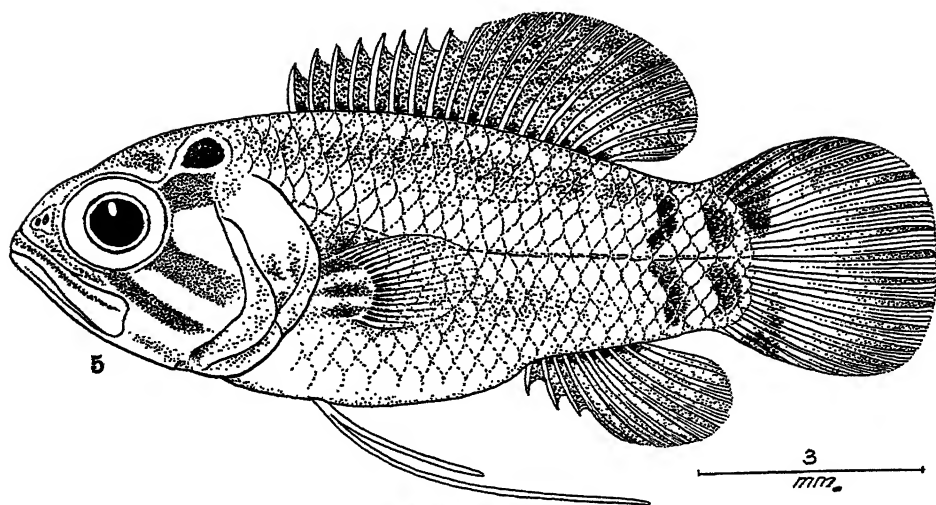


Fig 5.—*Plesiops melas* Bleeker.

Fig. 6.—*Pomacanthus semicirculatus* (Cuvier).

Color when fresh in alcohol flushed with red and the black longitudinal bands well contrasted, the third or median ending in a distinct black spot at the caudal base. Also another narrower dark longitudinal band extends from upper hind edge of eye, close along below lateral line and distinct far as second dorsal fin. In almost all other ways these specimens agree in large measure with the 2 figures published by Jordan and Seale¹ and drawn from Samoan specimens. Nine, 24 to 56 mm., August 7, in pools. All these show a dark bar from upper hind eye edge interpolated between the supra-ocular and the main lateral or axial black bands.

CARANGIDAE

Caranx sexfasciatus Quoy and Gaimard

Scutes 39, last 5 on caudal base. D. I, VIII—I, 22, 1; A. II—I, 18, 1. Opercle without dark spot. Fins largely yellowish. One, 91 mm., July 27.

LUTJANIDAE

Lutjanus fulviflamma (Forskål)

Two, 40 to 55 mm., July 27; one, 31 mm., August 2, in pools. Depth $2\frac{1}{2}$ to $2\frac{3}{4}$. Agree with Day's figure (6) except that the black lateral blotch below front of soft dorsal is a little larger and entirely bisected by the lateral line.

Lutjanus bohar (Forskål)

Color when fresh in alcohol with back dark olive, sides and below paler to gray, with reddish suffusion on under surfaces of head, abdomen, tail and over most of caudal. Following courses of scales at their junctures and much more distinctively above lateral line and on upper sides, dark streaks, leaving median pale spot on each scale, the dark lines and rows of pale spots all very even, definite and contrasted. On middle of back above lateral line a diffuse pearly pink spot and another close below bases of last dorsal ray, and within areas of each dark bordering lines of scales form complete and distinct reticulations. Iris gray, with scarlet ring around pupil. Spinous dorsal blackish brown and same color extended on upper front half of soft dorsal but its hind half pale grayish and upper edge of fin narrowly white. Anal with spinous fin blackish on membranes and same color extended back along lower submargin of soft anal, and greater posterior half reddish, lower edge of soft anal narrowly whitish and spines pale terminally. Upper edge of caudal peduncle and upper submargin of caudal fin blackish, with very narrow upper edge white; lower edge of caudal with similar black submarginal band, but not extended far forward on lower edge of caudal peduncle. Pectoral light gray buff, base dark gray and axil pale. Ventral broadly blackish in front, spine in lower front edge narrowly whitish, also rest of fin posterior pale reddish. One, 113 mm., July 27.

Apparently not previously recorded from the Riu Kius.

¹ Bull. Bur. Fisher. (U. S.), vol. 25, 1905 (1906), p. 243, figs. 36 and 37.

POMADASYIDAE***Plectorhinchus diagrammus* (Linnaeus)**

General color in alcohol largely bright yellow, paler to nearly white underneath. Six black longitudinal bands. Iris, except as crossed by black band, yellowish. Dorsals bordered with black, black basally where formed as black blotch on spinous fin and band on soft fin. Anal with lower border black, with median black band and 2 basal black spots. Caudal with black basal blotch, extending also into axil. Ventral with black blotch in front. One, 163 mm., July 27.

SPARIDAE***Monotaxis grandoculis* (Forskål)**

General color in alcohol olivaceous green on back and above, below pale to whitish. Dark olivaceous brown band across interorbital, through eye and down over cheek. Second broad dark brown transverse band from predorsal down to behind base of pectoral; third broader band from middle of spinous dorsal and fourth from soft dorsal. Muzzle pale. Iris yellowish. Dorsals largely blackish, last dorsal rays pale yellowish. Anal broadly dusky basally, pale yellowish terminally. Caudal yellow, each lobe with broad blackish submarginal band, parallel with upper and lower edges of fin. Pectoral pale yellowish, brown basally and axil pale. Ventral pale to whitish basally, dark gray brown terminally. One, 85 mm., July 27.

MULLIDAE***Pseudupeneus trifasciatus* (Lacépède)**

General color in alcohol crimson. Iris crimson. Muzzle orange red. Lips scarlet. Barbels crimson basally, chrome yellow terminally. Black postocular blotch little less than eye. Dark gray brown blotch below first dorsal and smaller one at interdorsal space. Also large black blotch below front of second dorsal. Black saddle-like blotch on caudal peduncle. First dorsal scarlet basally, orange terminally. Second dorsal pinkish gray, with 4 longitudinal golden yellow parallel bands on upper part of fin and basally broad gray black band, most distinct posteriorly and runs out in posterior extension of fin; third dorsal blotch on back invades front basal part of second dorsal. Caudal golden orange, paler behind, with upper and lower edges narrowly dark olive. Anal pinkish gray, with 5 horizontal parallel gray bands. Pectoral pale orange, with median dark basal spot. Ventral orange red, front edge narrowly blue. Three, 93 to 120 mm., July 27.

***Pseudupeneus cyclostomus* (Lacépède)**

Color in alcohol brilliant sulphur yellow generally. Back, top of head, cheeks and opercles bright orange red. Iris pale crimson. Maxillary chrome yellow. On preorbital pale gray band extends from front side of snout to eye, margined on each side by a brown line. Fins all brilliant uniform yellow and squamous base of caudal with orange tinge. One, 140 mm., July 27.

***Pseudupeneus chryserydros* (Lacépède)**

General color in alcohol drab brown, more or less uniform. Iris crimson. On side of snout 5 parallel equidistant pearly blue bands to eye and behind

bounded by 5 golden yellow similar bands in the intervals though 2 of pearly blue bands below eye. Cheeks and prepectoral region suffused with dull violaceous. Long barbels nearly reaching ventral grayish, terminally golden yellow. Large pale or light gray saddle-like blotch behind second dorsal on caudal peduncle above. First dorsal dark gray brown. Second dorsal gray, gray black basally. Anal gray with 4 horizontal golden yellow bands. Caudal dark olive brown, more greenish terminally. Paired fins olive, ventral with dark olive on front edge. One, 110 mm., June 27.

PEMPHERIDAE

Pempheris oualensis Cuvier

Depth slightly less than head or predorsal. Predorsal length subequal with depth. Scales 55 + 15 in lateral series; 29 transversely.

General color in alcohol brown, head and whole abdominal region suffused with dark chocolate brown, with iridescent silvery shades. Cheek, opercle and prepectoral region with indian red shades. Iris gray black above and below, otherwise buff white. Dorsal and caudal dull red basally and medially, terminally dark gray, blackish on dorsal. Other fins whitish or pink, with dark chocolate along anal base. Pectoral base both externally and in axil blackish. One, 143 mm., July 27. Also five, 30 to 34 mm., August 7, in pools, are included somewhat doubtfully as the young.

GIRELLIDAE

Girella mezina Jordan and Starks

Two, 65 to 75 mm., August 7, in pools. Transverse white band very distinct. Breast and belly below also white. Iris gray brown.

CHAETODONTIDAE

Forcipiger longirostris (Broussonet)

One, 140 mm., July 27. In alcohol color brilliant golden yellow. Compared with Morita's painting as published by Jordan and Evermann in 1905, my specimen has a gray pectoral which extends $1\frac{1}{2}$ times to the caudal base. The ventrals are brilliant chrome yellow (not orange). The courses of the scales are longitudinally incised or arched slightly downward along side of abdomen and tail below. The gray breast is sharply delimited from the white pectoral base by a rather dark streak transversely and little inclined back and down close before the pectoral base. Third anal spine equals snout.

Rhabdophorus trifasciatus (Mungo Park)

One, 109 mm., July 27.

Linophora vagabunda (Linnaeus)

One, 120 mm., July 27. In alcohol brilliant golden yellow generally, the coloration agreeing with Speigler's colored figure, published by Bleeker as *Tetragonopterus (Linophora) vagabundus*.

Tetragonopterus citrinellus (Cuvier)

Color in alcohol bright golden yellow, dark spots gray brown, of which the 7 lower scale rows slope down and posteriorly. Black band begins on

front of spinous dorsal, extends to eye and then continues down on cheek, narrowing below to meet its fellow. Soft dorsal, caudal and anal more or less grayish yellow and marked with innumerable small golden spots. Membranes of spinous dorsal yellow terminally, gray medially. Soft dorsal with upper edge narrowly white with narrow dark gray submarginal line. On lower edge of both anals black marginal band, narrowing behind, also a broad white submarginal band. Caudal more or less grayish posteriorly. Pectoral gray brown, also ventral, though latter little darker terminally and anteriorly with front edge and spine narrowly pale. One, 110 mm., July 27.

Color pattern greatly contrasted with the spots on the upper scales all sloping obliquely upward and posteriorly, while those below are inclined downward and posteriorly.

***Chaetodontops lunula* (Lacépède)**

Two, 23 to 25 mm., July 29, in rock pools. They agree with Baldwin's drawing, published as the young of *Chaetodon lunula* by Jordan and Evermann² from Honolulu.

***Chaetodontops melannotus* (Schneider)**

Color when fresh in alcohol largely golden yellow. Back gray brown, with faint trace of paler spot larger than eye, well below spinous dorsal medially. Each scale on body with dark gray spot, so that they form longitudinally series slightly inclined upwards. Black band from slightly before spinous dorsal down and across eye on cheek, narrower than eye, and not joining its fellow on isthmus. However, a black spot on front part of breast. Gray band from middle of spinous dorsal longitudinally and broadening on soft dorsal where bordered with dark gray, leaving broad yellow submarginal band with narrow edge of fin dark gray. Anal similar to soft dorsal, but its lower margin entirely golden. Caudal peduncle with transverse black band, broken medially on right side of body. Caudal brilliant golden basally, medially with narrow transverse gray black band, terminally gray. Pectoral gray, yellow basally. Ventral brilliant golden yellow. One, 110 mm., July 27.

***Oxychaetodon falcula* (Bloch)**

Color when fresh in alcohol with first transverse black band through eye, second from predorsal to opercle, third from fifth to ninth dorsal spines down to little below middle of sides and fourth from last dorsal rays down to rays close behind first anal ray, narrowed below. Caudal with median black crescent, arched toward base of fin and hind submargin of fin black. On body dark edges of scales form reticulated design. Spinous anal membranes blackish. Paired fins pale olive buff. One, 44 mm.

***Megaprotodon strigangulus* (Gmelin)**

General color when fresh in alcohol drab, little paler below. Two pearly longitudinal bars slightly above median line of body. Broad black band from shortly before spinous dorsal down and including eye and then over cheek to front of breast, bordered in front and behind by a bright yellow line. About 2 inclined gray black lines on back, and at median line of body 7 are given off in opposite directions, sloping down and back. Iris gray

² Bull. U. S. Fish Comm., vol. 23, pt. 1, 1903 (1905), p. 367, fig. 160.

black. Short space before dorsal and both fins bright orange golden, with tip of each flap behind end of spine white and entire edge of soft dorsal narrowly white against a narrow black submarginal line. Anal like dorsal. Caudal black, narrowly bordered yellow above and below, hind edge narrowly white against narrow black submarginal line, then a broader bright yellow band. Paired fins grayish, with golden tinge. Two, 120 to 133 mm., July 27.

Speigler and Morita have given colored figures which surely fall far short of the brilliancy of this species.

HOLACANTHIDAE

Pomacanthus semicirculatus (Cuvier)

Figure 6.

One, 15 mm., July 29. This is a younger stage than shown by Fraser-Brunner.³

Pomacanthus chrysurus (Cuvier)

One, 47 mm., July 27. Agrees with my figure of *Holacanthus nicobariensis*.⁴ Color black, with pearly white transverse lines.

AMPHIPRIONIDAE

Amphiprion sebae Günther

Color when fresh in alcohol dark olivaceous on back with a golden tinge, sides and below bright golden orange. Broad transverse pearly white band from predorsal down to subopercle, margined each side with dark to blackish brown. Second pearly white band from last 2 or 3 dorsal spines or first 1 or 2 dorsal rays down to preanal region, with dark borders. Third pearly white transverse band on caudal peduncle, merging into bright golden yellow of caudal. Paired fins and anal largely golden yellow or gray white, with or without lower edge narrowly dark brown. Dorsals other than noted dark olive brown like back. Four, 65 to 83 mm., July 27.

CHROMIDAE

Chromis notatus (Schlegel)

Figures 7 and 8 (dentition).

Depth $2\frac{1}{2}$; head $3\frac{3}{4}$, width $1\frac{1}{4}$. Snout (in profile) $5\frac{1}{4}$ in head, tip level with lower edge of pupil; eye $3\frac{3}{4}$, greater than snout, slightly less than interorbital; maxillary short, extends down below front edge of eye, length $3\frac{3}{4}$ in head; teeth small, simple, conic, uniform, in bands in jaws narrowed posteriorly, outer row 64 above and 45 below little enlarged; palate edentulous; tongue pointed; upper jaw only partly protractile; interorbital convex, broad, width 3 in head; preopercle edge entire. Gill opening extends forward opposite front edge of eye. Gill rakers $7 + 19$, lanceolate, equal gill filaments or $\frac{1}{2}$ of eye.

Scales 16 in upper arch of lateral line, 8 in lower section to caudal base; 3 above lateral line to spinous dorsal origin; 8 or 9 below upper section to anal origin; 4 rows on cheek, with uppermost row on infraorbital. Axillary

³ Proc. Zool. Soc. London, 1933, p. 564, text-fig. 10a.

⁴ Not of Schneider, in Fowler and Bean, Bull. U. S. Nat. Mus., no. 100, vol. 8, 1929, p. 186, fig. 9 (upper right figure).

ventral scale $3\frac{1}{2}$ in fin. Vertical fins all well scaled, also small scales on pectoral base.

D. XIII, 12, fifth spine $1\frac{1}{2}$ in head, last spine 4, fourth ray $1\frac{1}{2}$; A. II, 11, second spine 2, fourth ray $1\frac{1}{2}$; least depth of caudal peduncle 2; upper caudal lobe 3 in rest of fish, deeply forked, with slender pointed lobes; pectoral 3, rays II, 17; ventral I, 5, spine 2 in fin, first ray extended to reach anal.

General color in alcohol rich olive green, inclining to gray on under surface of head, breast and belly. Each scale on body with distinctly dark margin, producing a definite reticulated appearance. Dorsals and anals blackish, with their last rays little more olivaceous. Caudal olive green, hind margin little grayish brown. Iris dark gray, eyeball blackish marginally. Pectoral in large blackish brown blotch, inclusive of all of axil, fin gray brown like ventral. Broad ring around vent black, extended back to anal. One, 118 mm.

Jordan and Snyder describe the color in alcohol as brownish, and with "inconspicuous, narrow dark lines, one on each row of scales, extending along the sides of body", a statement so vague and indefinite, if not misleading. The 2 specimens I collected in Hong Kong have largely spoiled in their preservation and are useless for comparison. "Lateral line incomplete, ending below insertion of soft dorsal" is another statement not in agreement with my specimen.

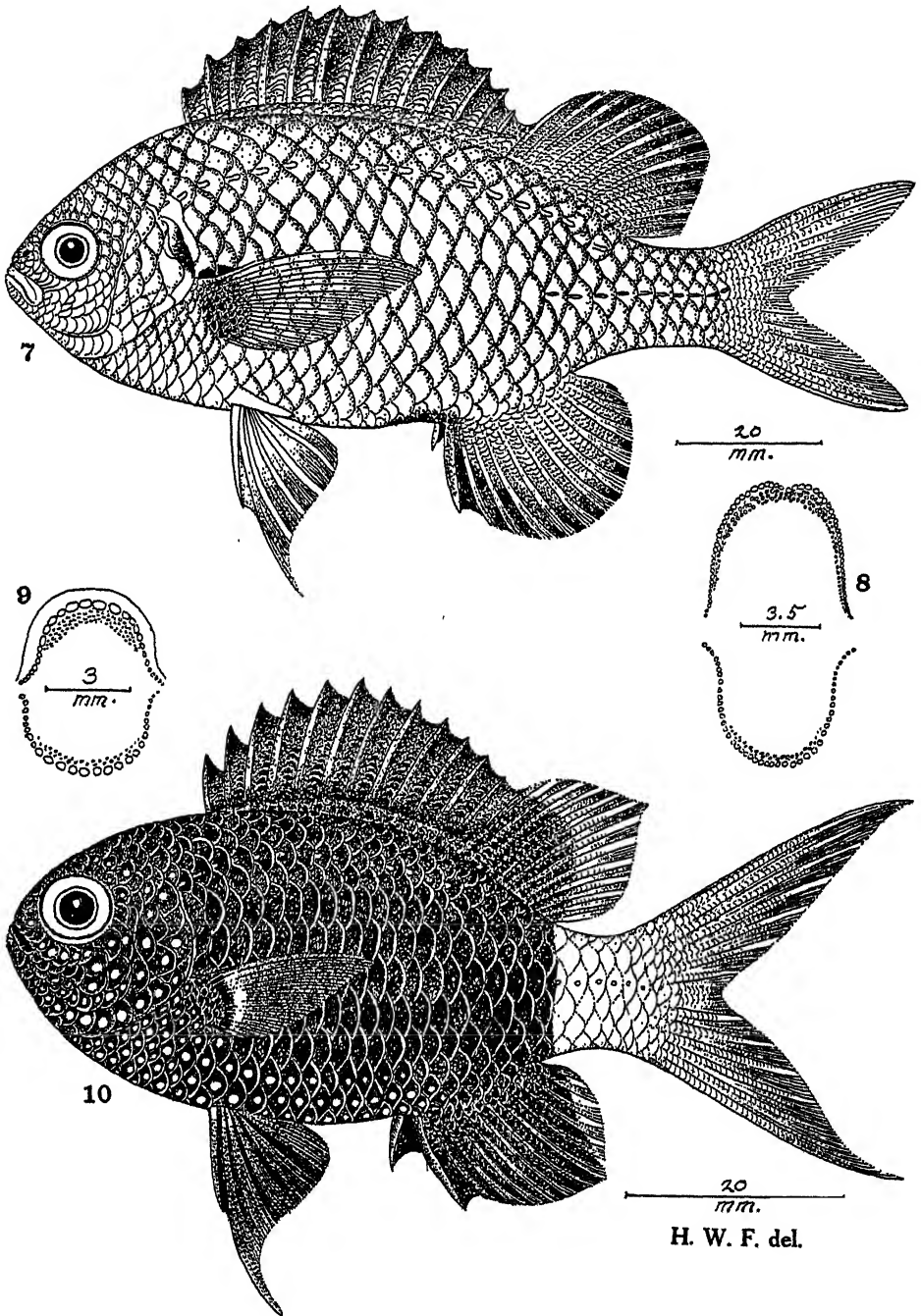
Chromis dimidiatus margaritifer new subspecies Figures 9 (dentition) and 10.

Depth 2; head $3\frac{1}{2}$, width $1\frac{1}{2}$. Snout (in profile) 5 in head, with tip in front level with lower edge of eye; eye $2\frac{1}{2}$, greater than snout and subequal with interorbital; maxillary oblique, reaches below front edge of eye, $5\frac{1}{2}$ in head; mouth small, closed jaws even in front; lips narrow; teeth in bands in jaws, with outer row little enlarged in front, simple, conic, 24 above and 32 below; in each jaw an inner band of finely villiform teeth, upper larger, broader and more extensive; interorbital $2\frac{1}{2}$ in head, convex; preopercle edge entire. Gill opening extends forward opposite front pupil edge. Gill rakers 6 + 12, lanceolate, $\frac{3}{4}$ of gill filaments which are $\frac{1}{2}$ of orbit.

Tubular scales 16 in upper section of lateral line, ending 4 scales before caudal peduncle, 10 in lower section to caudal base and 2 more on latter; 3 scales above upper section of lateral line and first dorsal origin; 8 below to anal origin; 16 predorsal forward to premaxillary and nostril; preorbital scaleless; infraorbitals with row of scales in anterior half of their course and counted posteriorly from eye to lower edge of preopercle 3 rows of scales. Vertical fins all more or less finely scaled, also pectoral base. Ventral without pointed axillary scale.

D. XII, 12, first spine 3 in head, sixth spine $1\frac{1}{2}$, last spine 2, fifth ray $1\frac{1}{10}$; A. II, 12, second spine $1\frac{1}{2}$, fifth ray $1\frac{1}{2}$; least depth of caudal peduncle $1\frac{1}{2}$; pectoral 1, rays II, 14; caudal widely forked, upper lobe $1\frac{1}{2}$ in rest of fish; ventral $2\frac{3}{4}$, spine $2\frac{1}{10}$ in fin, rays I, 5.

Color when fresh in alcohol with head and body back to caudal peduncle, front basal half of soft dorsal and most of soft anal, dark blackish brown, with posterior part of dorsal, slightly on last anal rays, all of caudal peduncle and caudal white, and in strong contrast. On side of head, breast and belly many of scales with pale pearly gray central spot, with largest

Figs. 7-8.—*Chromis notatus* (Schlegel).Figs. 9-10.—*Chromis dimidiatus margaritifera* new subspecies.

spots on largest scales. Base of pectoral, inclusive of axil black, but adjoining a narrow white transverse area, leaving greater part of fin terminally gray white. Spinous dorsal, ventral and spinous anal black. Iris dark or gray black, with narrow golden ring around pupil.

A.N.S.P., no. 72008. Aguni Shima, Riu Kiu Islands. July 27. Length 82 mm. Type.

Compared with Mintern's lithographic figure, published by Günther as *Heliastes dimidiatus* from a Raiatea specimen, it agrees in its body contour, largely naked preorbital, its contrasted black and white coloration though with the white on the anal fin much less extensive. Disagreement is seen in the pale or bright colored paired fins, no basal black pectoral blotch, nearly entire membranes to spinous dorsal, caudal lobes not ending in filaments, upper branch of lateral line extending to within one scale of caudal peduncle, no lower section to lateral line indicated and relatively scaleless bases to the vertical and pectoral fins.

Although the original description of *Heliastes dimidiatus* Klunzinger is without a figure several details in agreement are outstanding. Thus the depth is given as 2, the caudal lobes elongated points, bases of pectoral and ventral black and the pectoral hyaline. The anterior dark color of the body is said to extend to the origin of the anal fin, apparently embracing only the front half of the body, and thus far less extensive than the coloration of my specimen.

The squamation of the head seems distinctive, especially the naked preorbital, narrow front border of the snout. The pearly gray band on the infraorbitals, obscure pearly gray spots on cheeks, breast and lower sides and contrasted black base of the pectoral on its outer face with a pearly gray border, are further items.

The figure given by Dr. Max Poll⁵ is identified with *Chromis iomelas* Jordan and Seale, in which the white posterior area of the body is greatly more extensive than in the present species. It also shows the preorbital closely scaled and is without indication of pearly spots on the head, abdomen and the iris is indicated as white. The vertical fins are also shown with far less scalation, or only basal, and none at all on the caudal.

(*margaritifera* pearl bearing.)

***Chromis ovatiformis* new species**

Figures 11 and 12 (dentition).

Depth $1\frac{3}{8}$; head $3\frac{1}{8}$, width $1\frac{3}{8}$. Snout (in profile) $7\frac{7}{8}$ in head, its tip level with lower edge of pupil; eye $2\frac{1}{2}$, greatly exceeds snout, $1\frac{1}{2}$ in interorbital; maxillary short, reaches opposite front edge of eye, length $4\frac{3}{8}$ in head; mouth small, gape short, closed jaws with mandible slightly protruded in front; lips narrow; teeth 40 above in outer row and 36 below, slightly enlarged, simple and conic, followed in each jaw by inner narrow band of simple villiform teeth; interorbital $2\frac{1}{4}$ in head, broadly convex; preopercle

⁵ Bull. Mus. Roy. Hist. Nat. Belgique, vol. 18, n. 61, Dec. 1942, p. 14. Mataeia.

entire. Gill opening extends forwards opposite front edge of eye. Gill rakers $8 + 18?$, lanceolate, subequal with gill filaments, which are $\frac{1}{2}$ of orbit.

Tubular scales 14 in upper section of lateral line which is continued as 6 pores arched down to straight or lower section which is composed of $10 + 2$ pores; 3 scales above upper section of lateral line to spinous dorsal origin, 8 below to anal origin; 19 predorsal scales; single row of scales on preorbital and anterior row of infraorbitals, and 3 rows on cheek from posterior to eye and lower edge of preopercle. Vertical fins all densely scaly, also small scales on pectoral base. Ventral without elongated pointed axillary scale.

D. XII, 13, first spine $3\frac{1}{2}$ in total head length, sixth spine $1\frac{3}{4}$, last spine 2, fifth ray $1\frac{1}{10}$; A. II, 12, 1, second spine $1\frac{1}{2}$, seventh ray $1\frac{1}{2}$; least depth of caudal peduncle $1\frac{1}{2}$; caudal deeply forked, lobes pointed, $2\frac{1}{10}$ in rest of fish; pectoral $2\frac{3}{4}$, rays II, 15; ventral $2\frac{1}{2}$, spine $1\frac{1}{2}$ in fin, rays I, 5.

Color in alcohol yellowish olive, back but little darker. Preorbital and side of snout brilliant yellow, with pearly blue band on suborbitals below eye. Caudal peduncle and most of basal squamous areas on second dorsal, anal and caudal whitish, rayed portions of fins grayish. Iris olive gray, with golden ring around pupil. Squamous areas on both dorsals and anals olivaceous, terminally fins grayish. Pectoral grayish, blackish brown basally, also in axil. Ventral olive yellow basally, gray terminally.

A.N.S.P., no. 72009. Aguni Shima, Riu Kiu Islands. July 27. Length 78 mm. Type.

Only the type obtained. Distinguished chiefly by its deeply ovoid contour, compactly scaled head and fins, and its distinctive coloration. It agrees in many ways with the figure of *Chromis isharae* Okada and Ikeda,⁶ surely wrongly identified with *Dascyllus isharae* Schmidt 1930. It has but 4 rows of scales on the cheek below the suborbital row, caudal equally pale as caudal peduncle and with its upper and lower edges dark, no pearly band on suborbitals, dark ventrals, an extensively dark basal pectoral blotch and details of squamation on the fins, besides a dark band along and behind preopercle, and one above opercle.

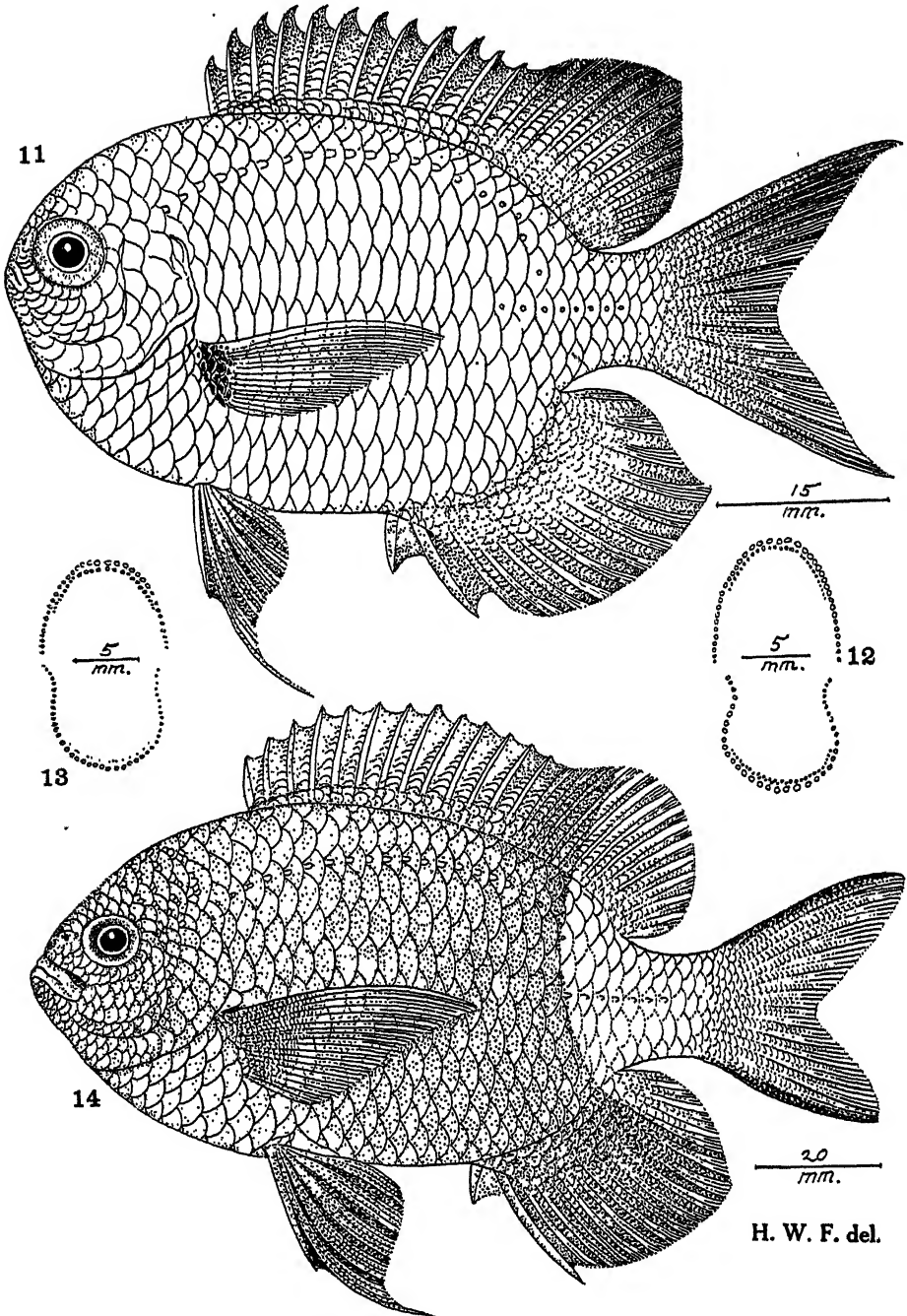
(*ovatus* oval + *forma* form.)

SIPHONOCHROMIS new genus

TYPE.—*Siphonochromis lepidostethicus* new species.

Body deeply ovoid, well compressed, depth over half of standard length. Head moderate, compressed. Snout short. Eye moderate, in front half of head. Mouth small, terminally superior. Teeth small, simple, conic, with outer row little enlarged and anteriorly in jaws a narrow feeble inner band of minute teeth. Preorbital narrow, densely scaled and lower edge little free. Interorbital broad. Gill opening well cleft forward. Gill rakers lanceolate, slender, about half as long as eye. Scales on head small, crowded about eye, on mandible and on preopercle flange. Largest scales on middle

⁶ Trans. Biograph. Soc. Japan, vol. 3, no. 2, Oct. 1939, p. 196, text fig. 25 (Itoman, Okinawa-Honto).



H. W. F. del.

Figs. 11-12.—*Chromis ovatiformis* new species.Figs. 13-14.—*Siphonochromis lepidostethicus* new species.

of side of body, where narrowly imbricated. Lateral line in 2 sections, both of which are comprised mostly of tubes. Ventral axil with long pointed scale. Pectoral with broad basal area finely scaled. Dorsal spines 13, rays 14. Anal spines 2, rays 15. Caudal well forked. Paired fins sub-equal, pectoral reaching $1\frac{1}{2}$ to caudal base.

A genus apparently distinct in the lateral line comprised in both sections chiefly of tubes, the accessory small basal scales to the large ones on top of the head and the broad scaly base to the pectoral fin. A specimen of *Demoisellea multilineata* (Guichenot) from Key West, Florida, has the lower section of the lateral line composed of pores, an elongated body contour and no accessory scale at bases of those on upper posterior part of head.

(σιφων tube + *Chromis*.)

Siphonochromis lepidostethicus new species Figures 13 (dentition) and 14.

Depth $1\frac{1}{2}$; head $3\frac{1}{2}$, width $1\frac{1}{2}$. Snout (in profile) $4\frac{1}{10}$ in head as measured from snout tip, which is level with lower eye edge; eye $3\frac{1}{4}$, greater than snout, $1\frac{1}{2}$ in interorbital width; maxillary reaches back below front eye edge, length $3\frac{1}{2}$ in head measured from snout tip; mouth moderate, oblique, closed lower jaw slightly protruded in front; teeth with outer enlarged row, about 40 in each jaw and inner narrow series of minute or villiform teeth anteriorly; interorbital convex, moderately elevated; preopercle edge entire. Gill opening extends forward opposite front eye edge. Gill rakers 10 + 22, lanceolate, $\frac{2}{3}$ of gill filaments, which are $1\frac{1}{2}$ in eye.

Tubular scales 17 in upper section of lateral line, followed by 4 pores with one on each scale; lower section with 7 tubes to caudal base, but not extending on latter; 3 scales above upper section of lateral line to spinous dorsal origin, 10 below to anal origin. Larger scales on upper posterior part of head with one or more small auxiliary scales crowded basally. Pre-orbital with more or less double row of scales, closely crowded and extend back over infraorbitals as single row of scales; below on cheek 3 rows of scales to preopercle ridge and below on flange a double row of scales. All of vertical fins all more or less largely scaly, with scales finer terminally on fins. Pectoral with basal third covered closely with small scales. Ventral with pointed axillary scale half length of spine.

D. XIII, 14, first spine $3\frac{2}{3}$ in total head length, seventh spine $1\frac{1}{2}$, thirteenth spine 2, fifth ray $1\frac{1}{2}$; A. II, 15, 1, second spine $1\frac{1}{2}$, fifth ray $1\frac{1}{4}$; least depth of caudal peduncle 2; caudal deeply forked, upper lobe $2\frac{2}{3}$ in rest of fish; pectoral II, 17, length $2\frac{1}{2}$; ventral length $2\frac{1}{2}$, rays I, 5, spine half length of fin.

General color when fresh in alcohol olive black, each scale forming darker margins so as to produce a reticulated pattern. Preopercle flange and border of gill opening blackish. Lips blackish. Pectoral base, including axilla, blackish. Restricted posterior part of soft dorsal and less so of anal, together with caudal peduncle and caudal whitish, with upper and lower caudal edges blackish. Ventral blackish.

A.N.S.P., no. 72010. Aguni Shima, Riu Kiu Islands. July 27. Length 137 mm. Type.

The distinctions are expressed in the preceding generic account. Compared with Mintern's lithograph, published by Günther as *Heliastes dimidiatus* and shown to differ with a naked preorbital, scaleless soft dorsal,

soft anal, caudal and pectoral fins, only 4 rows of scales on cheek below eye, upper section of lateral line continued back apparently as pores to the upper edge of the caudal peduncle, no lower section of lateral line and the caudal fin without the upper and lower edges dark.

(λεπίς scale + στήθος pectoral; with reference to the pectoral fin.)

Hoplochromis caeruleus (Cuvier)

Color in alcohol caerulean blue, paler to silvery white on under surfaces. Opercle with brilliant blue and emerald tints. Iris pale or pearly gray white. Fins all more or less gray blue, upper and lower margins of caudal deeper. A gray black bar across pectoral base. One, 69 mm., August 7.

"Color iridescent grayish, with iridescent purplish blue stripes. Eye black, pupil very narrowly edged with yellow, then with black. Opercle iridescent green". (Tinkham.) Pectoral base with triangular gray black mark at origin with apex at bases of lowest rays and axil gray black. Fins all grayish. Outer edges of caudal lobes darker gray than rest of fin. Two, 74 to 87 mm., June 27.

Pomacentrus tropicus Seale

Color when fresh in alcohol bright golden yellow, becoming intense orange yellow on soft vertical fins. Iris golden. Two pearly blue lines from maxillary to eye extend up in iris, pearly blue bar along suborbitals below eye and several pearly blue spots on opercle. Skinny flaps behind tips of dorsal spines each golden olivaceous. Small obscured dark spot, half size of pupil, at origin of pectoral fin, but axil of fin yellow. Lower edge of anal fin olive dusky with a submarginal pearly band. One, 80 mm., July 27.

Pomacentrus philippinus Evermann and Seale

One, 115 mm., July 27. Row of scales narrowly on infraorbitals, along edge of eye and 4 more rows on cheek. Caudal peduncle and hind borders of soft dorsal and anal rather dark gamboge. Broad black blotch over pectoral base.

Baldwin's drawing published with the original description by Evermann and Seale shows the preorbital scaleless.

Pomacentrus atrilabiatus new species

Figures 15 and 16 (dentition).

Depth $1\frac{1}{2}$ to 2; head $3\frac{1}{4}$ to $3\frac{3}{4}$, width $1\frac{3}{8}$ to $1\frac{1}{2}$. Snout (in profile) $3\frac{1}{2}$ to $4\frac{1}{2}$ in head, tip level with lower edge of eye; eye $3\frac{3}{8}$ to $3\frac{1}{2}$, greater than snout, $1\frac{1}{4}$ in interorbital; maxillary inclined, reaches below front eye edge, length $3\frac{1}{2}$ to $4\frac{1}{2}$ in head; mouth small, terminal, closed jaws even; teeth in jaws uniserial, compressed, closely set, ends truncated, about 40 above and 30 below, without inner band of small villiform teeth; interorbital $2\frac{1}{4}$ to 3 in head, convex, moderately elevated; preorbital with lower edge entire; preopercle with hind edge finely and evenly serrated and lower edge entire. Gill opening extending forward opposite front pupil edge. Gill rakers 3 + 10, lanceolate, $\frac{1}{2}$ of gill filaments, which are $\frac{1}{3}$ of eye.

Tubular scales 20 in upper section of lateral line, followed by 2 or no pores; lower section composed of 6 to 8 pores to caudal base; 3 scales above lateral line to spinous dorsal origin, 12 below to spinous anal origin; 25 predorsal scales forward to nostrils. Vertical fins all well scaled, with scales

large and irregular on spinous dorsal and anal. Pectoral base broadly with small basal scales. Ventral with pointed axillary scale $2\frac{1}{2}$ in spine, which is little over half of fin length.

D. XIII, 16, 1 or 15, 1, first spine $3\frac{2}{3}$ to 4 in head, eighth spine $1\frac{3}{4}$ to 2, fifth ray $1\frac{1}{10}$ to $1\frac{1}{2}$; A. II, 13, 1 or 14, 1, second spine $1\frac{1}{2}$ to $1\frac{7}{8}$, sixth ray $1\frac{1}{10}$ to $1\frac{3}{8}$; least depth of caudal peduncle 2; caudal forked, length $2\frac{1}{2}$ to 3 in rest of fish; pectoral 1 in head, rays II, 17; ventral rays I, 5, fin 1.

Color when fresh in alcohol blackish brown and on body each scale diffusely dusky on margin. Lower side of head, breast and abdomen gamboge brown. Preorbital livid drab, bordered above and below darker. Lips blackish. Iris brown, appears pale to whitish, but with narrow border of orbit blackish. Fins all more or less blackish. Axil of pectoral blackish, only very narrow strip visible above pectoral origin.

A.N.S.P., no. 72011. Aguni Shima, Riu Kiu Islands. July 27. Length 105 mm. Type.

A.N.S.P., no. 72012. Same data as type. Length 100 mm. Paratype. *Pomacentrus niomatus* De Vis⁷ described with depth $2\frac{1}{2}$, head $3\frac{2}{3}$, both dorsal and anal rays 13, uniform pale brown and a minute super-axillary black spot. These details will hardly allow its identification with the present species. *Pomacentrus inornatus* as lithographed by Searle, and published by Regan for an Easter Island specimen, indicates a species related to the present in most of its structural characters, but uniformly dark. Regan notes "a small blackish spot above the axil of pectoral" not shown on the figure. The pointed soft vertical fins are not in agreement with my specimen. A specimen from Isigake Island, Riu Kiu, is figured by Okada and Ikeda as *Pomacentrus inornatus*, but differs in having the infraorbital with a row of scales, cheek with 4 rows of scales (description gives 3), scaleless pectoral, bases of vertical fins all with narrow squamation, a single row of scales between last tube of upper section of lateral line and lower or horizontal section, edge of spinous dorsal nearly entire or with only very slight emargination between spine tips.

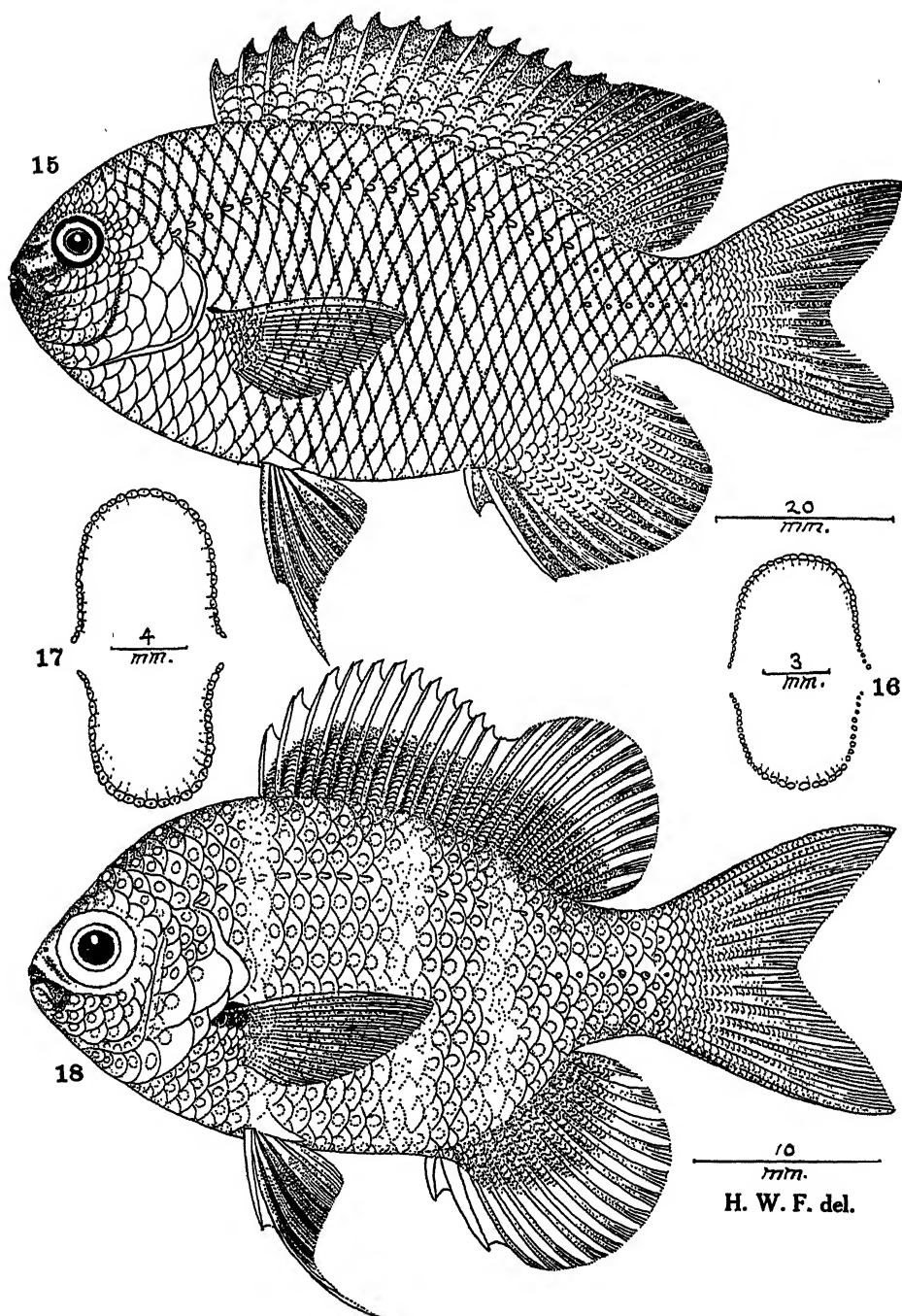
The figure of the related Hawaiian *Pomacentrus jenkinsi* Jordan and Evermann, as shown by Atkinson's drawing they republish, has the pre-orbital extended (apparently free?) into the postocular region, is without indication of the lower section of the lateral line, the spinous dorsal membranes with entire edges, scales large on front of cheek, axillary ventral scale not clearly defined and basal scales on dorsal fins regular and rather small.

(*ater* black + *labrum* lip.)

Eupomacentrus nigricans (Lacépède)

Color when fresh in alcohol largely uniform brown, under surface of head, abdomen and caudal peduncle pale to light brown. Most of fins, except pectoral, darker terminally. D. XII, 15, A. II, 12. One, 31 mm., July 27.

⁷ Proc. Linn. Soc. New South Wales, vol. 8, 1883, p. 451 (type locality, "probably South Sea Islands")



Figs. 15-16.—*Pomacentrus atrilabiatus* new species.
 Figs. 17-18.—*Chrysiptera paucifasciata* new species.

H. W. F. del.

One of the most distinctive characters for this species, as set forth by Weber and Beaufort, is the narrow preorbital, its width less than half the eye diameter, yet on the very same page their figure (46) shows the pre-orbital depth equal to the eye.⁸ My specimen has the anterior preorbital depth less than orbital diameter and scaleless. The infraorbitals are, however, with a single row of scales.

One, 24 mm., July 29. When fresh in alcohol top of head, including opercle above, predorsal and front of back, also caudal fin, pale to whitish. Dorsal spines XII. The infraorbitals are very narrow and do not appear to have been scaly. Comparison with *Pseudopomacentrus niomatus* (De Vis) is afforded by Whitley's revealing figure of the holotype.⁹ It shows the preorbital depth as less than $\frac{1}{3}$ of the orbit and like the narrow infra-orbitals scaleless.

***Abudefduf sordidus* (Forskål)**

Two, 32 or 33 mm., July 27. Three or four transverse narrow pale bands on body and black ocellated blotch on front of caudal peduncle nearly large as eye. A small black spot at axil of pectoral fin, which does not invade the inner base or axil of the pectoral fin.

One, 24 mm., July 29. Differs only in lacking the small black blotch on front of caudal peduncle above.

***Abudefduf vaigiensis* (Quoy and Gaimard)**

One, 21 mm., July 26; six, 18 to 154 mm., July 27; three, 23 to 26 mm., July 29; small one indicated as collected in pools. Small one 20 mm., July 27, has scales on predorsal not quite extending as far forward as the nostrils but with the dark transverse bands agreeing with Speigler's figure of *Glyphidodon caelestinus* as published by Bleeker in 1879. One, 154 mm., July 27, has 5 black transverse bands and basal $\frac{2}{3}$ of pectoral scaly. One, 105 mm., July 27, with very contrasted color pattern, has the back and upper surfaces bright greenish, below whitish and all 5 black transverse bands greatly contrasted.

Lönnberg's examination of the type of *Chaetodon saxatilis* Linnaeus 1758 has shown it to belong to the American species heretofore usually called *Abudefduf marginatus* (Bloch), which name would be superseded.

***Abudefduf septemfasciatus* (Valenciennes)**

Three, 23 to 38 mm., July 27, in pools. The 5 dark vertical bands on the body evenly parallel, little wider than pale or light interspaces and sixth on caudal peduncle with a black saddle above, little less than eye in size. Dark bands invading vertical fins as dark basal reflections. Black spot size of pupil at pectoral origin and axil of fin dark. Scales extend forward on head to middle of interorbital space.

⁸ Fishes Indo Austral. Archip., vol. 8, 1940, p. 353.

⁹ Mem. Queensland Mus., vol. 9, pt. 3, June 29, 1929, p. 220, text-fig. 2.

Abudefduf sexfasciatus (Lacépède)

One, 28 mm., July 27. Dark band on each caudal lobe joined with band at base of caudal.

Stegastes dickii (Liénard)

General color when fresh in alcohol brown, extending back to black transverse band running from front of soft dorsal base to front of soft anal base. Posterior to black transverse band caudal peduncle and caudal fin bright chrome yellow. Scales in dark anterior area of body with darker bands following along each lower edge of scale exposure. Pearly bar from upper edge of upper lip to eye, and several pearly spots about eye. Iris gray, narrow golden circle around pupil. Dorsal and anal fins largely brownish. Pectoral chrome yellow, grayish terminally. Ventral gray black. One, 80 mm., July 27.

Mintern's figure, published by Günther as *Glyphidodon dickii* surely appears faulty as it shows the upper section of the lateral line extending back to the upper base of the caudal fin which appears scaleless, likewise the end of the snout is more naked and the pectoral base also scaleless.

Negostegastes leucozona (Bleeker)

Color when fresh in alcohol largely olivaceous, slightly paler on belly and under surface of head. Most all scales marked with a single pearly blue spot, though spots much larger on side of head. On spinous dorsal from fifth to seventh spines a transverse pale to whitish band extends down before vent. Black blue edged ocellus, slightly larger than eye, on last 3 dorsal spines and first 2 rays, entirely above upper branch of lateral line. Small black saddle behind dorsal on front of caudal peduncle, extending over 3 scales. Exposure of each body scale with darker ill-defined spot, pearly spot appearing basal. Small black spot at pectoral origin, slightly invading axil of fin. Spinous dorsal membrane, except as noted, largely dark gray, which color extends on soft dorsal base, fin paler terminally. Caudal pale olive. Anal gray black. Pectoral olive. Ventral dark gray. One, 43 mm., July 27.

This specimen agrees with Bleeker's description in 1859. Speigler's colored figure he publishes as *Glyphidodon leucozona* differs greatly in the position of the transverse pearly bar, which is shown as emanating below the first to third dorsal spines and extending down close behind paired fin bases. It would appear also quite faulty in the long snout, well exceeding the eye diameter, the low position of the mouth, but 2 scales shown between the bases of the pectoral and ventral fins (4 in my specimen), the predorsal scales falling well short of the nostril, soft anal base shorter than soft dorsal base (subequal in my specimen), dorsal rays 14 (his description giving 15 to 17, and in my specimen 14), and a very short axillary ventral scale (clearly $\frac{2}{3}$ of ventral spine in my specimen).

Chrysiptera biocellata (Quoy and Gaimard)

Color when fresh in alcohol with upper surface of head and back dull olive, little darker on head. Rest of head, body and vertical fins bright

golden yellow. Bright cobalt blue band, narrow at first on upper front of snout reaches upper edge of eye and superciliary, then breaks to embrace large elongate black blotch extending over 5 scales, but broadly borders it all around until half way up on last dorsal spines. Smaller black blotch over 3 scales at bases of last 3 dorsal rays and bordered behind and below by cobalt blue, which extends back along upper edge of caudal peduncle to small black basal spot at bases of uppermost caudal rays. Base of soft dorsal over greater part dark brownish black. Lower anal edge grayish. Two, 40 to 48 mm., July 27.

The larger specimen agrees in almost every way with the smaller specimen but its blue color is more vivid, 3 oblique bars on lower side of muzzle before eye, and innumerable blue spots scattered over sides of head and body.

***Chrysiptera glauca* (Cuvier)**

Depth 2½. Lips, when turned back, dark gray white. Iris gray. Body uniform dull olive, pale below. Drab tints on head and back. Vertical fins gray brown. Paired fins dull olive, little grayish terminally. One, 89 mm., July 27.

***Chrysiptera rex* (Snyder)**

Color when fresh in alcohol with front half of body and head dark gray brown, and posteriorly and on tail, soft dorsal, anal and caudal golden yellow. A deep blue spot, smaller than eye, on opercle above. Head with many small scattered blue spots, less distinct or absent on snout above and cranial region. Each scale on body with a small blue spot. Front part of dorsal and anal gray blue. Paired fins dull gray. Iris gray blue, but without the evident blue spot, or bar, shown in Snyder's figure. One, 59 mm., in pools, August 7.

***Chrysiptera cyanea* (Quoy and Gaimard)**

One, 71 mm., July 27. Smaller damaged specimen, same data, is 48 mm. long to end of damaged caudal peduncle.

***Chrysiptera sapphirus* (Jordan and Richardson)**

Two, 34 or 35 mm., July 26; one, 20 mm., July 27; one, 23 mm., July 29; twelve, 19 to 50 mm., August 7, in pools. Agree largely with the original figure. The largest specimen differs in having along edge of spinous dorsal each of upper cutaneous lobes with a marginal light blue bar, also lobes extended beyond the tips of the spines and the emargination deeper; entire bases of both dorsals broadly cobalt blue and no dark marks on the rayed fin; caudal likewise uniformly gray; anal gray, with broad blue base; paired fins dull gray; each scale exposure on body with 2 small black dots, one well elevated and the other well lowered on scale exposure, with a brilliant deeper blue spot between; black spot at pectoral origin little smaller than pupil. The figure fails to show any lower section of the lateral line, though my specimens have a median row of 7 or 8 pores before the caudal base and 1 or 2 on the latter, besides the ventrals are uniformly pale.

Most of above specimens brilliant blue, fins all bluish. Black bar before and through eye, these extended back on upper side of head. Another along lower edge of eye.

Chrysiptera richardsoni (Snyder)

Color when fresh in alcohol pale gray brown generally, also paler and with silvery reflections on lower surfaces. Each scale on body with apparent dark basal bar appearing to show through the overlapping scale and therefore not submarginal. Under surfaces without dark bars on sides. Iris largely white, with some grayish. Dorsals with scaly base pale, membranes of fins gray, becoming dark posteriorly or on upper margin of rayed fin. Anal whitish, lower edge broadly blackish. Caudal white, lower edges bordered broadly blackish and upper border continued forward to last soft dorsal ray. Paired fins pale or whitish, with small black spot at pectoral origin, but not invading the pale or whitish axil. Three, 33 to 35 mm., July 27.

Atkinson's drawing as published by Snyder in 1912 differs, especially in the scalation of the head as the infraorbitals are shown as scaleless and the cheeks with 3 rows of scales, the lowest row apparently covering the preopercular flange. In my specimens only 12 rows are present on the cheek, leaving a very narrow naked suborbital band and the preopercular flange naked. Atkinson's figure also shows the spinous dorsal edges entire, while in my specimen they are notched behind the tip of each spine.

Chrysiptera paucifasciata new species

Figures 17 (dentition) and 18.

Depth $1\frac{1}{2}$ to $1\frac{1}{3}$; head $2\frac{1}{2}$ to 3, width $1\frac{1}{2}$ to $1\frac{1}{4}$. Snout (in profile) 5 to 6 in head, its tip below level of lower pupil edge; eye $2\frac{1}{2}$ to $2\frac{3}{4}$, greater than snout or interorbital; mouth with short gape, closed jaws even; maxillary short, little inclined, reaches slightly behind front eye edge; lips thin; about 30 compressed bidentate teeth in each jaw, forming an even close set cutting edge; interorbital low, level, so upper surface of muzzle more or less flattened; preopercular edge entire. Gill opening large, extends forward with free membrane over isthmus opposite front edge of eye. Gill rakers 7 + 13, lanceolate, equal gill filaments, which are $\frac{1}{2}$ of eye.

Scales 17 to 20 tubular in upper section of lateral line; 6 or 7 pores in lower section to caudal base; 4 scales above upper section of lateral line to spinous dorsal origin, 9 or 10 below to anal origin; 16 or 17 predorsal; 3 rows on cheek. Muzzle and subocular rim scaleless. Bases of soft vertical fins scaly, areas extending about half way up on dorsals and anals, and more extensive on caudal. Pectoral base scaly. Ventral with pointed axillary scale over half length of ventral spine.

D. XIII, 13 or 14, fifth spine $1\frac{1}{2}$ to $1\frac{1}{3}$ in head, fifth ray $1\frac{1}{2}$ to $1\frac{1}{3}$; A. II, 13, second spine 2 to $2\frac{1}{2}$, fifth ray $1\frac{1}{2}$ to $1\frac{1}{3}$; least depth of caudal peduncle $1\frac{1}{2}$ to $1\frac{1}{4}$; caudal $2\frac{1}{2}$ to $3\frac{1}{10}$ in rest of fish; ventral $2\frac{1}{2}$ to $2\frac{3}{4}$, rays I, 5, spine $1\frac{1}{2}$ to $2\frac{1}{2}$ in head; pectoral 1 to $1\frac{1}{10}$, rays 1, 16.

Color when fresh in alcohol dark brown. On sides of body most of scales, especially below lateral line, each with pearly median spot. On middle of body transverse pearly gray to white narrow band, extending from forward part of spinous dorsal where broadest, down to close before

front of anal. Four scales posteriorly, another similar parallel narrow pearly band. Black blotch, size of pupil, at pectoral origin and extends into pectoral fin axil. Iris gray. Spinous dorsal dark blackish brown, except as noted, with color extending over basal part of soft dorsal, leaving outer part pale marginally. Anal blackish brown, slightly paler to whitish posteriorly. Caudal dull or light green. Pectoral blackish brown. Ventral whitish, with broad medial longitudinal dark brown band.

A.N.S.P., no. 72014. Aguni Shima, Riu Kiu Islands. July 27. Length 46 mm. Type.

A.N.S.P., nos. 72013 and 72015. Same data. Length 40 and 23 mm. Paratypes. Also A.N.S.P., no. 72016. Same locality. July 29. Length 20 mm. Paratype.

A trim little species, with unique color pattern, 3 rows of scales on cheek, well forked caudal fin and very narrow infraorbitals.

(*pauci* few + *fasciata* banded; with reference to its pale transverse bands.)

Chrysiptera personata new species

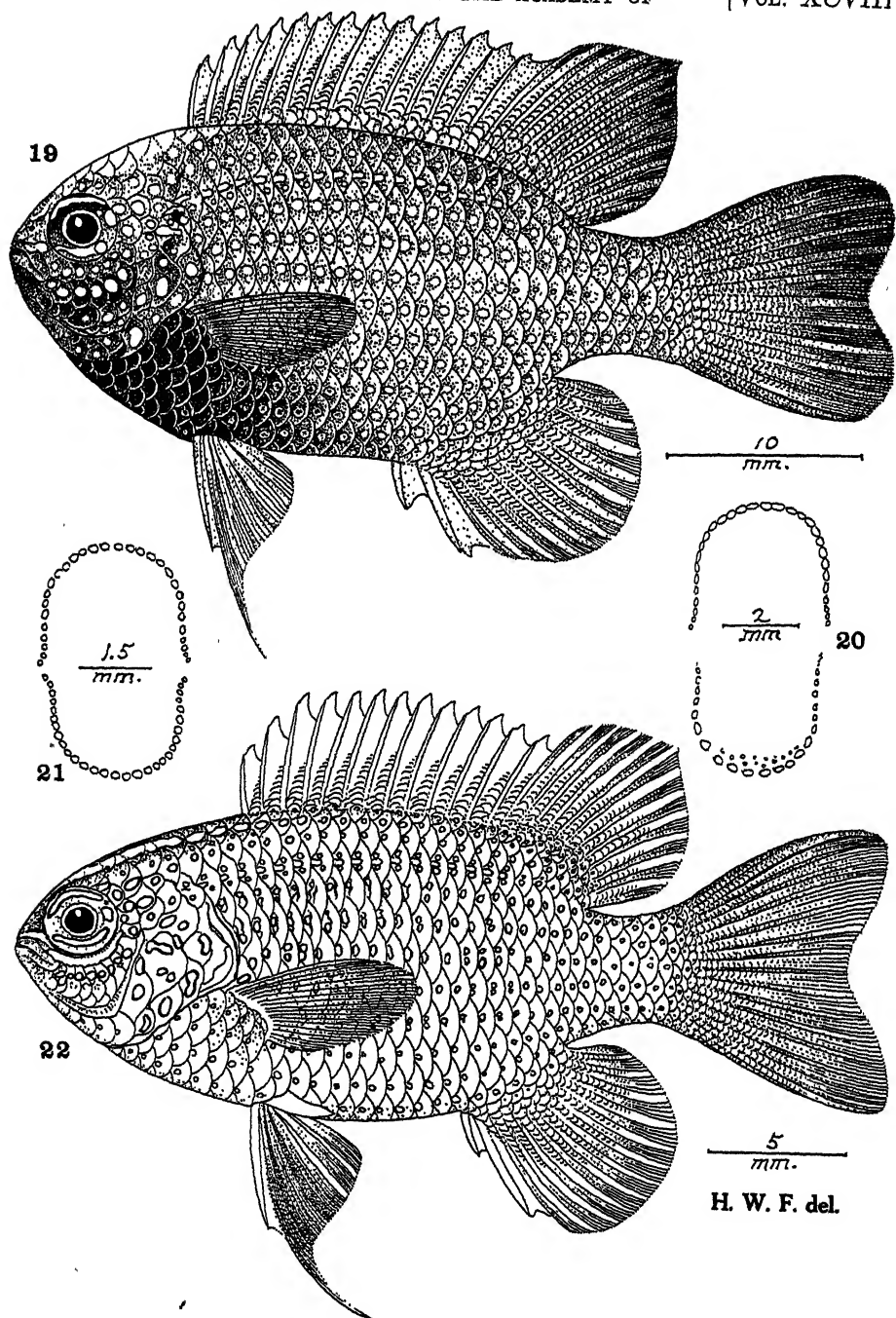
Figures 19 and 20 (dentition).

Depth $1\frac{2}{3}$; head $3\frac{1}{2}$ to $3\frac{3}{4}$, width $1\frac{1}{2}$ to $1\frac{3}{4}$. Snout (in profile) $4\frac{2}{3}$ to $5\frac{1}{2}$ in head, with tip nearly level with lower edge of pupil; eye $2\frac{1}{2}$ to $2\frac{3}{4}$, greater than snout or interorbital or subequal with latter; mouth small, gape short, well inclined, closed jaws even; teeth about 30 above and 20? below, apparently simple, close set and form nearly even cutting edge; in mandible an inner, narrow band of small irregular simple teeth; interorbital 3 to $4\frac{1}{2}$ in head, broadly convex; preorbital and preopercle edges entire. Gill opening extends forward opposite front edge of pupil or front edge of eye, membrane free over isthmus. Gill rakers 5 + 10, lanceolate, long as gill filaments, which are about $\frac{2}{3}$ of eye.

Scales 16 or 17 tubular in upper section of lateral line followed by 3 or 4 pores and last may drop to row of scales below; 8 to 10 pores in lower section, of these first may be advanced from second pore by 3 or 4 scales though in same longitudinal scale row; 3 scales between upper section of lateral line and spinous dorsal origin and $1\frac{1}{2}$ above to soft dorsal origin, 10 to 12 below to anal origin; 3 or 4 rows on cheek, with lowest row present or absent and with one or but a few small scales on preopercle flange; uppermost row of cheek scales on infraorbitals also small; 15 or 16 predorsal scales extend forward little before nostril. Rayed vertical fins all more or less scaly. Pectoral base scaleless. Ventral with short axillary scale.

D. XIV or XIII, 12 or 13, fifth spine $1\frac{1}{2}$ to 2 in head, fifth ray 1 to $1\frac{1}{2}$; A. II, 12 or 13, second spine $1\frac{1}{2}$ to $2\frac{1}{4}$, fifth ray 1 to $1\frac{1}{2}$; least depth of caudal peduncle $1\frac{2}{3}$ to $1\frac{3}{4}$; pectoral 1, 16, fin $1\frac{1}{2}$ to $1\frac{3}{4}$; ventral rays I, 5, spine $1\frac{1}{2}$ to 2, long filamentous first ray $2\frac{2}{3}$ to $2\frac{3}{4}$ in length of fish without caudal; caudal little emarginated, length $2\frac{2}{3}$ to $2\frac{3}{4}$.

Color when fresh in alcohol with head dark olive brown, fading back on predorsal and most of trunk to pale, or into brilliant golden yellow of rest of body and vertical fins. Near front end of snout above brilliant cobalt blue band extends up to, broadening and finally disseminating in pearly blue arc on each scale to dorsal. Upper edge of eye with blue band and extended forward on preorbital. Two rows of blue spots across cheek, upper



Figs. 19-20.—*Chrysiptera personata* new species.
Figs. 21-22.—*Chrysiptera hollisi* new species.

over suborbitals and other over upper row of scales. Elsewhere many blue spots and blotches scattered on head, and others over scale rows of body. Pectoral gray brown, bases pale. Ventral golden.

A.N.S.P., no. 72017. Aguni Shima, Riu Kiu Islands. July 27. Length 48 mm. Type.

A.N.S.P., nos. 72018 and 72019. Same data. Length 32 and 33 mm. Paratypes. No. 72020. Same locality. July 26. Length 16 mm. Paratype. No. 72090. Same locality. August 2. Length 30 mm. Paratype. Nos. 72021 and 72022. Same locality. August 7. Length 37 to 40 mm. Paratypes. In last two only faint traces of the blue marks on the head remain. All from pools.

Known chiefly by its coloration.

(*personatus* masked, with reference to the dark color of the head.)

Chrysiptera hollisi new species

Figures 21 (dentition) and 22.

Depth 2 to $2\frac{1}{4}$; head $2\frac{2}{3}$ to 3, width $1\frac{3}{4}$ to $1\frac{7}{8}$. Snout (in profile) 5 to $6\frac{3}{4}$ in head, with tip level to little below level with lower pupil edge; eye $2\frac{5}{8}$ to 3, greater than snout, subequal with interorbital; mouth little inclined, closed jaws even; maxillary oblique, extends below front eye edge, though not quite opposite front pupil edge; lips thin, smooth; teeth subconic, about 30 in each jaw, close set and form more or less even cutting edge; interorbital $2\frac{3}{8}$ to $2\frac{7}{8}$ in head, rather broadly convex; preorbital and preopercle edges entire. Gill opening extends forward opposite middle of eye or to front pupil edge. Gill rakers 7 + 14, lanceolate, slender, equal gill filaments or $\frac{2}{3}$ of eye.

Scales 17 or 18 tubular in upper section of lateral line, followed by 4 or 5 pores; lower section with 7 to 9 pores, or with first pore advanced 3 or 4 scales; 2 scales above lateral line to spinous dorsal origin, 9 below to anal origin; 13 or 14 predorsal scales; 3 rows on cheek but none on infraorbital or preopercle flange. Vertical fins finely scaled over greater basal portions. Pectoral scaleless. Ventral with pointed axillary scale $1\frac{1}{2}$ to $1\frac{3}{8}$ in ventral.

D. XIII, 12, fifth spine $1\frac{1}{2}$ to 2 in head, fifth ray $1\frac{1}{2}$ to $1\frac{3}{8}$; A. II, 12, second spine $1\frac{1}{2}$ to 2, third ray $1\frac{1}{2}$ to $1\frac{1}{4}$; least depth of caudal peduncle 2 to $2\frac{1}{16}$; caudal 1 to $1\frac{1}{2}$, slightly concave behind; pectoral rays 1, 16, fin $1\frac{1}{2}$ in head; ventral spine $1\frac{1}{2}$ to $1\frac{1}{4}$, fin $1\frac{1}{2}$ to $2\frac{3}{8}$ in fish without caudal fin.

Color when fresh in alcohol with cobalt blue line beginning on front end of snout, joining with its fellow, and continued back until below middle of second dorsal. Blue bar on preorbital, across lower part of iris and then up parallel with upper blue line, but approximately closer above and broken into detached spots. Two rows of blue spots arched on cheek, with upper more or less continuous and not broken as spots. Vertical fins uniformly gray brown, without spots, except on some basal scales.

A.N.S.P., no. 72023. Aguni Shima, Riu Kiu Islands. July 27. Length 33 mm. Type.

A.N.S.P., nos 72024 to 72026. Same data. Length 30 to 36 mm. Paratypes. Also no. 72027. Same locality. July 26. Length 29 mm. Paratype.

A grayish species, without any black blotches, though most of its scales each with a small brilliant blue spot or dot.

(For Mr. James J. Hollis, Carpenter's Mate First Class, for his diligence with the native fishermen in urging them to procure many of the numerous small fishes which have so greatly enriched the collections.)

Chrysiptera prughi new species

Figures 23 and 24 (dentition).

Depth $1\frac{2}{3}$; head $2\frac{2}{10}$, width $1\frac{1}{2}$. Snout (in profile) 6 in head, its tip nearly level with lower edge of pupil; eye $2\frac{1}{3}$, greater than snout or interorbital; maxillary short, reaches slightly beyond front edge of eye; mouth small, closed jaws even in front; lips thin; teeth apparently uniserial, row of 40 estimated in upper jaw, simple, compressed, close set, slightly notched terminally on at least median largest ones; lower teeth small, and in both jaws apparently form even cutting edges; infraorbital and preopercle edges entire; interorbital width 3 in head, low, broadly convex. Gill opening extends forward opposite front pupil edge. Gill rakers 4 + 12, slenderly lanceolate, long as $\frac{3}{4}$ of gill filaments or about $\frac{2}{3}$ of eye.

Scales 19 tubular an upper section of lateral line; 8 pores in lower section; 4 scales above upper section of lateral line to spinous dorsal origin; 11 below to spinous anal origin; 3 rows on cheek, with uppermost row on infraorbitals. Preopercular flange scaleless; 16 on predorsal forward to nostril. Bases of vertical fins finely scaly. Ventral axil (damaged), scale? Pectoral scaleless.

D. XII (soft fin estimated with 15? rays as damaged), fifth spine $1\frac{1}{2}$ in head; A. II, (soft fin largely damaged, with 13? estimated rays); least depth of caudal peduncle $1\frac{2}{10}$; caudal 1, slightly emarginate behind; pectoral $1\frac{1}{2}$, rays 1, 16; ventral rays I, 5, spine 2 in head, fin $1\frac{2}{10}$.

Color when fresh in alcohol with each scale on body marked with a pearly white spot. Pearly spot on each infraorbital and cheek scale, but no blue stripe on snout above or on interorbital space over eye. On opercle obscured pale or whitish broad area. No dark spots on head. Dorsals and anals largely gray black, only little paler behind. Caudal and caudal peduncle grayish white. Very small inconspicuous dark gray spot at pectoral origin, and reflected on upper inner part of fin but not invading axil. Ventral with front rays elongated, so spine only half of fin length.

A.N.S.P., no. 72028. Aguni Shima, Riu Kiu Islands. July 29. Length 33 mm. Type.

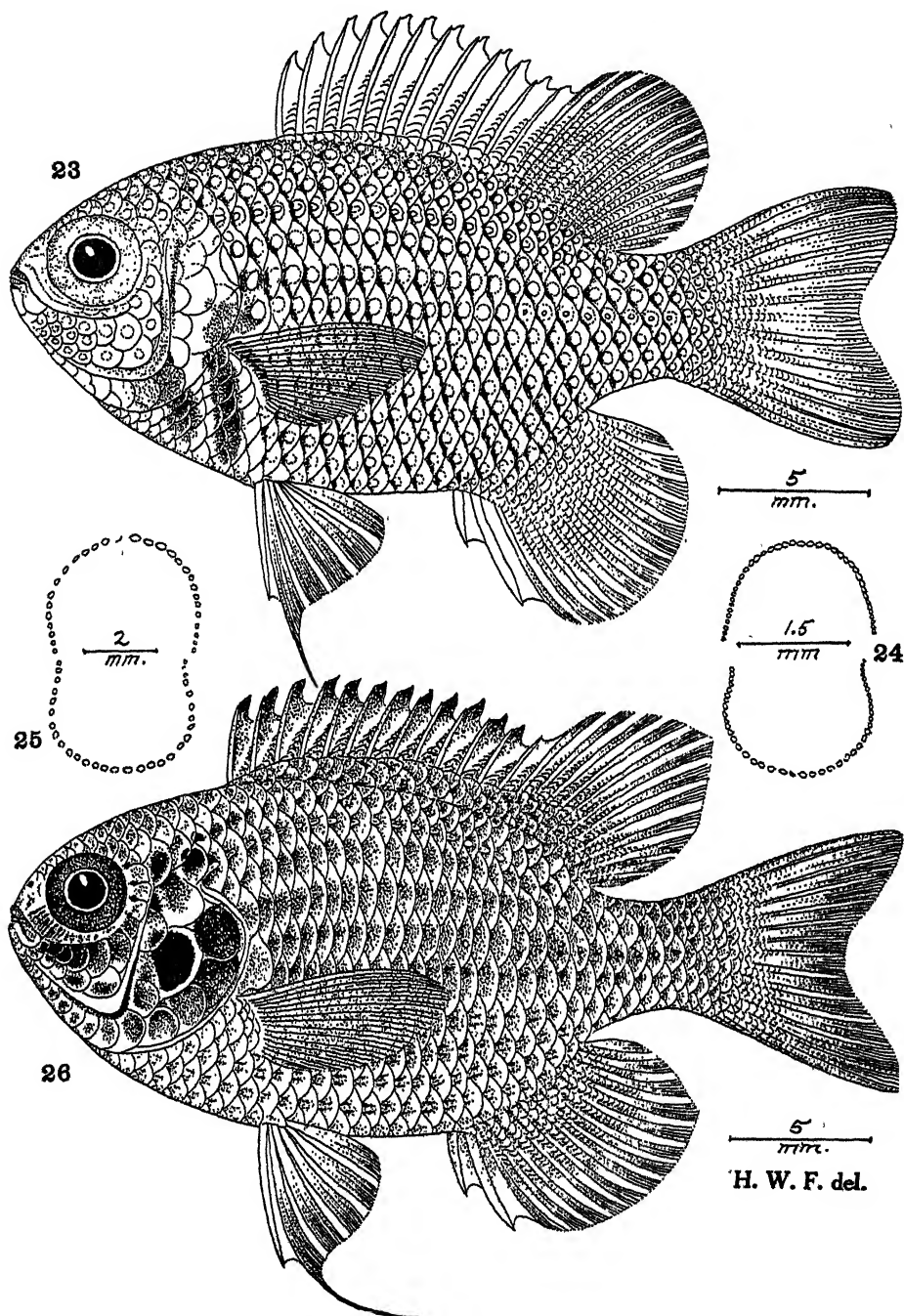
Only the type secured. A species differing chiefly in its coloration.

(For Captain Byron J. Prugh who greatly contributed in forming the Riu Kiu collection of fishes.)

Chrysiptera punctatoperculare new species

Figures 25 (dentition) and 26.

Depth $1\frac{2}{10}$ to $2\frac{1}{5}$; head $2\frac{2}{5}$ to 3, width $1\frac{1}{2}$. Snout (in profile) 5 to $6\frac{1}{2}$ in head, its tip nearly level with lower edge of pupil; eye $2\frac{1}{3}$ to 3, greater than snout, subequal to greater than interorbital width; maxillary short, oblique, reaches below front edge of eye; mouth small, closed jaws even in front; lips thin; teeth small, simple, subconic to little compressed, close set, uniserial, estimated about 30 above and as many below; preorbital and preopercle edges entire; interorbital $2\frac{2}{3}$ to 3 in head, low, broadly convex. Gill

Figs. 23-24.—*Chrysiptera prughi* new species.Figs. 25-26.—*Chrysiptera punctatoperculare* new species.

opening extends forward opposite middle of eye. Gill rakers $4 + 11$, lanceolate, slender, subequal with gill filaments, which are $2\frac{1}{4}$ in eye.

Upper section of lateral line with 15 to 17 tubular scales, which may be followed by 2 pores, lower dropping to scale row below; lower section with 9 or 10 pores, though first may be removed as 2 or 3 scales forward from others; 3 scales above lateral line to spinous dorsal origin, 9 below to anal origin; 12 or 13 predorsal forward to nostrils; preorbital, end of snout and suborbitals scaleless; 2 rows of scales on cheek. Vertical fins scaly basally. Pectoral scaleless. Ventral with short obtuse scale in axil.

D. XIII, 12 or 13, fifth spine $2\frac{1}{2}$ to $2\frac{1}{2}$ in head, fifth ray $1\frac{1}{2}$ to $1\frac{1}{2}$; A. II, 13, second spine 2 to $2\frac{1}{4}$, third ray $1\frac{1}{2}$ to $1\frac{1}{2}$; least depth of caudal peduncle $2\frac{1}{2}$ to $2\frac{1}{2}$; caudal $2\frac{1}{2}$ to $2\frac{1}{2}$ in rest of fish, hind edge emarginate; ventral $2\frac{1}{2}$, rays I, 5, spine $1\frac{1}{2}$ to $1\frac{1}{2}$ in head; pectoral $1\frac{1}{2}$ to $1\frac{1}{2}$, rays 1, 14.

Color when fresh in alcohol largely uniformly dark blackish brown, each scale with darker blotch or area on its exposure. Under surfaces scarcely paler, or but slightly lighter brown in most of specimens. Iris gray black. On opercle, subopercle and interopercle several large black blotches.

A.N.S.P., no. 72029. Aguni Shima, Riu Kiu Islands. August 7. Length 32 mm. Type.

A.N.S.P., nos. 72030 to 72038. Same data. Length 17 to 25 mm. Paratypes.

A very distinctly marked species, the large blackish opercular blotches especially outstanding.

(*punctatus* spotted + *operculum* opercle.)

Chrysiptera amabilis (De Vis)

D. XIII, ?; A. II, 10 ?. General color in alcohol largely blackish brown, with 3 transverse contrasted golden yellow bands; first embraces opercle extending above towards predorsal and below into prepectoral region; second golden band from opposite middle of spinous dorsal down to vent; third golden band on caudal peduncle. Iris silvery, especially whitish posteriorly; and gray black blotch above. Teeth whitish. Humeral scale golden. Dorsals largely blackish, spinous fin grayish above. Caudal yellowish, with 2 dark brown transverse bands. Pectoral golden green, dark brown basally and axil brown. Ventral black, grayish basally. One, 50 mm., July 27, in poor preservation.

Oliglyphisodon caeruleo-maculatus new species Figures 27 and 28 (dentition).

Depth 2 to $2\frac{1}{2}$; head $2\frac{1}{2}$ to $2\frac{1}{2}$, width $1\frac{1}{2}$ to $1\frac{1}{2}$. Snout (in profile) 4 to $4\frac{1}{2}$ in head, tip nearly to quite level with lower eye edge; eye 2 to $2\frac{1}{2}$, greater than snout, subequal with interorbital; maxillary little inclined, reaches back nearly opposite front pupil edge; mouth moderate, closed jaws even; teeth uniserial, more or less compressed, at least in front of jaws, with about 40 in each series; preorbital and preopercle edges entire; interorbital width $2\frac{1}{4}$ to $3\frac{1}{2}$ in head, low, depressed forward. Gill opening extends forward opposite middle of eye. Gill rakers $2 + 7$, lanceolate, $\frac{1}{2}$ of gill filaments which equal $\frac{2}{3}$ of eye.

Scales 18 to 19 tubular in upper section of lateral line; 8 in lower section to caudal base; 3 scales above upper section of lateral line to spinous dorsal origin, 9 below to anal origin; 22 predorsal forward to nostril. Cheek

with 3 rows of scales and lowest row on preopercle flange. Vertical fins scaly basally. Pectoral naked. Ventral axillary scale may have been present? but not evident now. Snout before nostril and suborbital scaleless.

D. XIII, 14, third spine $1\frac{1}{2}$ to $1\frac{3}{4}$ in head, sixth ray $1\frac{1}{2}$; A. II, 10 to 12, second spine $1\frac{1}{2}$ to 2, third ray $1\frac{1}{2}$; least depth of caudal peduncle 2; caudal $2\frac{3}{4}$ in rest of fish, hind edge emarginate; pectoral $1\frac{1}{2}$ to $1\frac{1}{4}$ in head, rays π , 16; ventral 1 to $1\frac{1}{2}$, rays I, 5.

Color when fresh in alcohol with back olive brown, sides and under surfaces whitish. Each scale on body with a pearly blue spot. Two distinct pearly blue spots before eye and others rather large on side of head. Iris with a broad blackish gray transverse band wide as pupil. Fins all more or less grayish. Spinous dorsal with median brown blotch on each membrane.

A.N.S.P., no. 72039. Aguni Shima, Riu Kiu Islands. July 27. Length 34 mm. Type.

A.N.S.P., no. 72040. Same locality, July 29. Length 22 mm. Paratype.

Apparently related to the Hawaiian *Oliglyphisodon imparipennis* (Vaillant and Sauvage)¹⁰ in the reduced gill rakers and dark banded eye. It differs however in the pearly blue spotted coloration.

(*caeruleus* blue + *maculatus* spotted.)

LABRIDAE

Labroides caeruleo-lineatus Fowler

One, 15 mm., July 25; one, 24 mm., July 27; one, 30 mm., August 2, in pools. These agree in almost every way with the type. Paired fins brown, ventrals little paler.

Anampses meleagrides Valenciennes

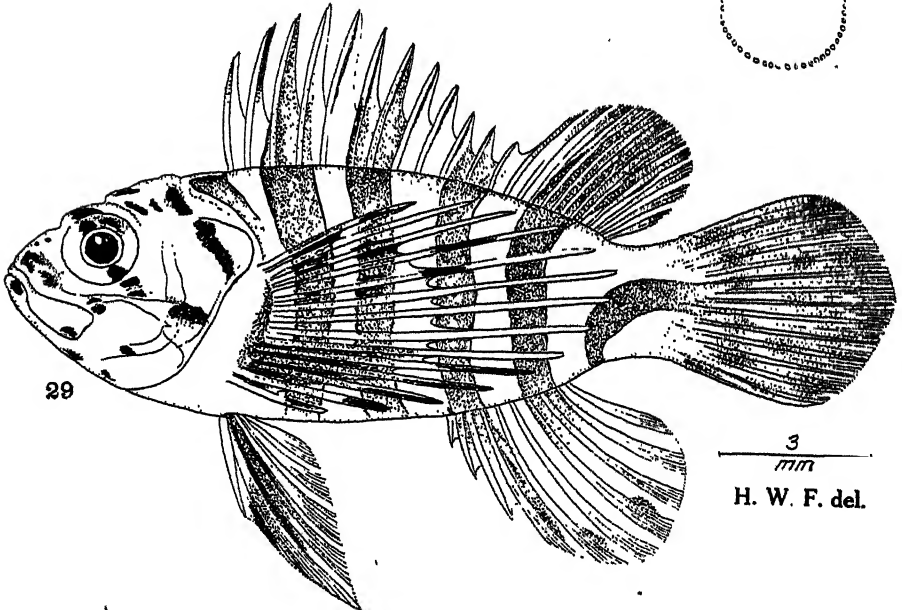
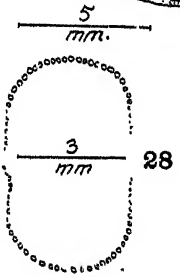
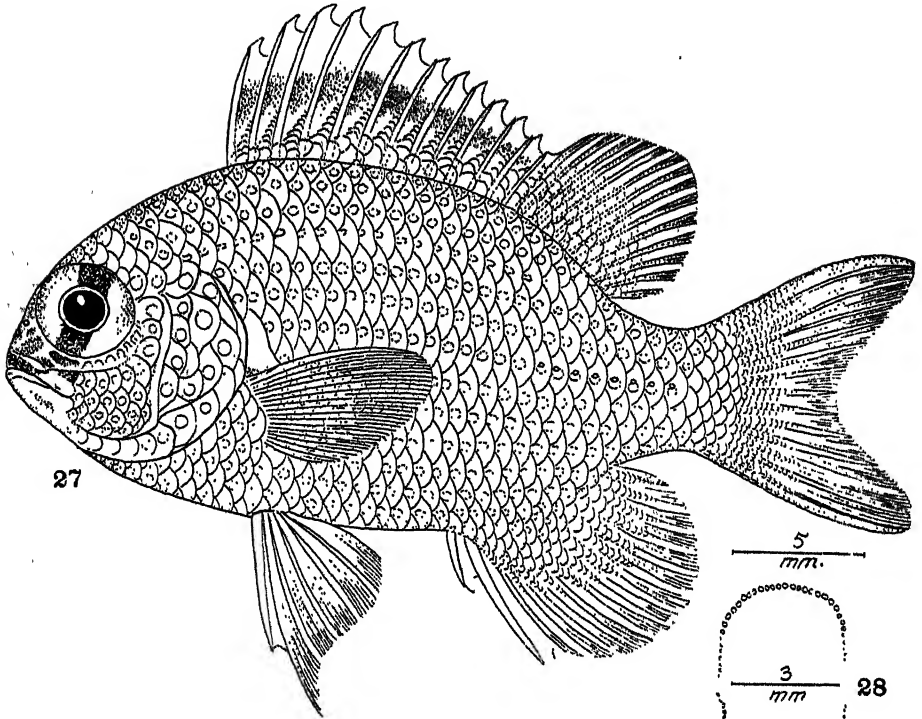
Figure 31.

"Living colors ivory black with porcelain or china white spots and tail orange yellow. Pinkish black around mouth and eye. Pupil black, edged with fiery red, violet and dark violet beyond". (Tinkham.) Black white edged ocellus large as eye on last dorsal rays. One, 105 mm., September 5.

Color when fresh in alcohol of small specimen blackish brown, with front of head and anterior part of trunk suffused with crimson. Iris crimson, bounded externally with blackish brown. Upper lip white, with brown edge above; lower lip more brownish. Broad blackish brown band from preorbital and front of eye, but not completely meeting across throat, and bounded in front and behind by broad white area. Brown diffusion across interorbital and another area broad and more distinctly dark brown across hind part of interorbital down over postocular, all of which covers head and connects below before gill opening. Diffuse brown band from front of spinous dorsal down to opercle. Chest white, followed by blackish brown over prepectoral and down over abdomen to include ventrals. From 3 scales behind head blackish brown, then extends back to embrace all of squamous

¹⁰ *Glyphisodon imparipennis* Vaillant and Sauvage, Rev. Mag. Zool., ser. 3, vol. 3, 1875, p. 279 (type locality, Honolulu).

Oliglyphisodon imparipennis Fowler, Proc. Acad. Nat. Sci. Phila., 1941, 266, fig. 17 (Waianae, Hawaiian Is.).



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Figs. 27-28.—*Oliglyphisodon caeruleo-maculatus* new species.
Fig. 29.—*Pterois volitans* (Linnaeus).

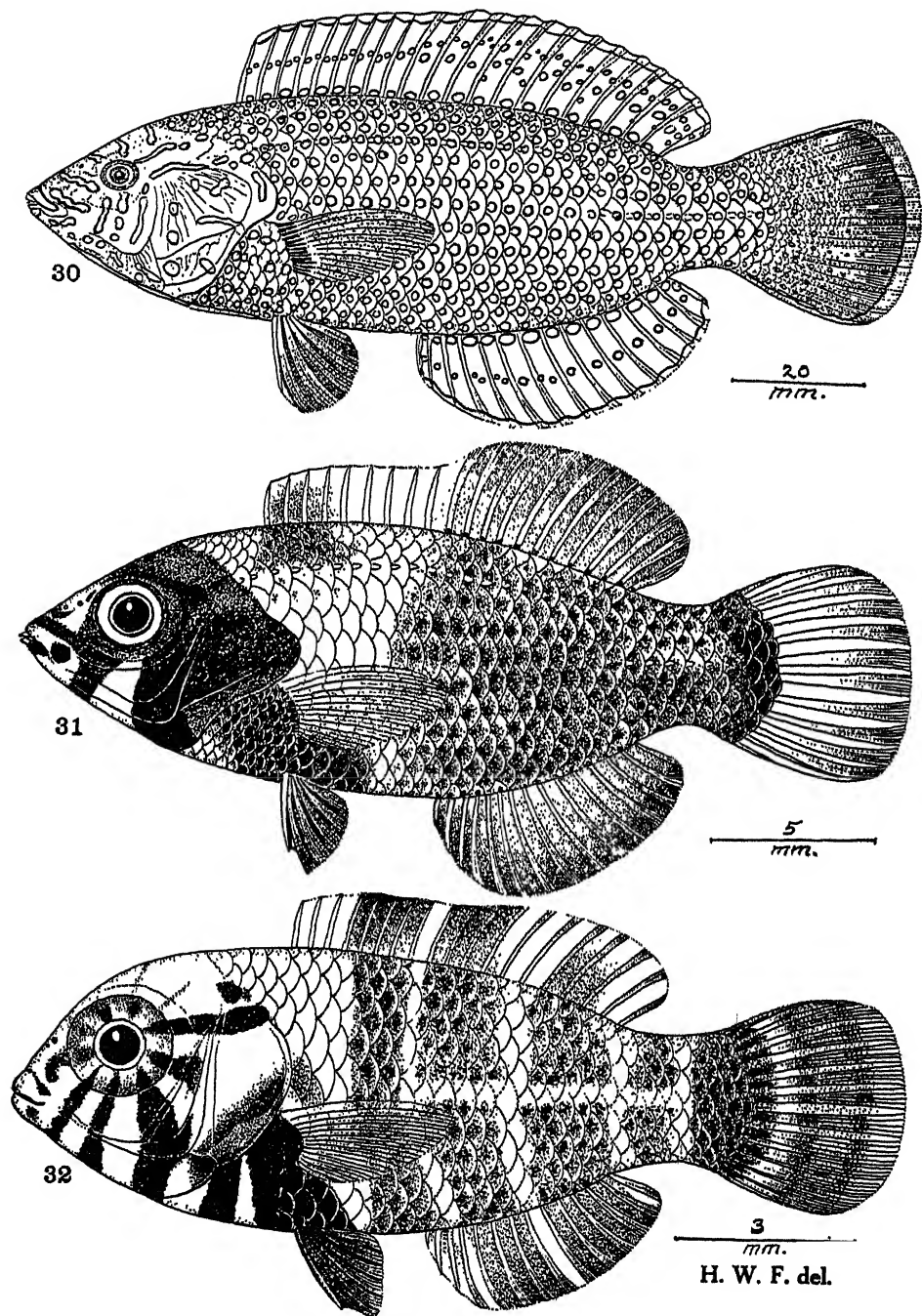


Fig. 30.—*Anampses tinkhami* new species.
Fig. 31.—*Anampses meleagrides* Valenciennes.
Fig. 32.—*Hemigymnus fasciatus* (Bloch).

base of caudal. On back, above middle of depressed pectoral fin, pair of pearl white spots large as pupil, one above the other also one above and the other below lateral line. Several other pearly spots along upper section of lateral line. Otherwise than the pale crimson area from third to sixth dorsal spines, fin blackish brown. Anal entirely blackish brown. Caudal golden yellow. Pectoral orange red, base pearly. Ventral black. The scales are without definite spots as seen in the adult. One, 27 mm., July 27, in pools.

Weber and Beaufort have adopted Bleeker's *Pseudanampses*¹¹ which is only vaguely mentioned and as it is without a formal genotype designation I here indicate *Anampses geographicus* Valenciennes as such. From Weber and Beaufort's account it would therefore embrace small scaled species (scales 49 to 51). It would not supersede *Ampheces* Jordan and Snyder 1902, which not only has priority in definition but also formal designation of the same genotype.

Anampses tinkhami new species

Figure 30.

Depth $3\frac{1}{10}$; head $2\frac{1}{2}$, width $2\frac{1}{2}$. Snout $3\frac{1}{2}$ in head, tip slightly below level of lower eye edge; eye $6\frac{1}{2}$, 2 in snout, $1\frac{1}{2}$ in interorbital; maxillary reaches $\frac{2}{3}$ to eye, little inclined; mouth small, closed lower jaw slightly included; ends of 2 canines in each jaw exposed in closed mouth; no other teeth; upper lip much broader than lower, fleshy and its inner surfaces with oblique folds or plications; interorbital $3\frac{1}{2}$ in head, convexly elevated; pre-orbital little broader than eye; opercle and preopercle with surfaces striated. Gill opening lateral, extends forward nearly opposite hind edge of preopercle. Gill rakers 6 + 10, lanceolate, compressed, equal $\frac{1}{2}$ of gill filaments which are about $\frac{2}{3}$ of eye.

Scales in lateral line with simple tubes, 19 + 8 + 2; 3 above to spinous dorsal base, 11 below to anal base; 15 predorsal forward opposite hind eye edge. Small scales on chest and breast. Of fins only caudal base scaly.

D. IX, 12, spines slender, pungent, first spine $3\frac{1}{2}$ in head, third ray $2\frac{3}{4}$; A. III, 12, third spine $3\frac{1}{2}$, fifth ray $2\frac{1}{2}$; least depth of caudal peduncle $2\frac{3}{4}$; caudal $1\frac{1}{2}$, hind edge convex; pectoral $1\frac{1}{2}$, rays 1, 11; ventral rays I, 5, spine 3 in head, first ray $2\frac{1}{4}$.

"Living colors dark olive gray, with iridescent bluish green spots. Pink violet suffusion around mouth and ventrally on head and belly. Eye with black pupil, narrowly edged with fiery red violet, outwardly by blue black. Transparent edge of caudal fin pale sea blue." (Tinkham.)

Color when fresh in alcohol with spots and markings on head turning bright blue with dark to blackish gray borders. A bright blue median streak or band extends from the chin posteriorly down to the breast and on last it is continued as a median row of small close set bright blue spots. Teeth white. Vertical fins and ventrals dull red, the dorsals and anals with a blue upper border next to a dark gray submarginal line, though not present on caudal. Blue marks on anal largely as a median row of blue spots and a basal row of greatly larger blue spots or blotches. Ventrals with blue bordering line in front and several blue marks on shorter or posterior rays, also blue spot on inner basal face of each fin. Pectoral orange brown,

¹¹ Atlas Ichth. Ind. Néerl., vol. 1, 1862, p. 101.

lighter subbasally and base broadly dark blackish brown, bordered by blue line separating yellow color.

A.N.S.P., no. 72041. Aguni Shima, Riu Kiu Islands. July 27. Length 132 mm. Type.

"Living colors dark violet gray, with iridescent bluish green scales. Tail orange, with orange red at very base. Supraocular stripe of olive, bifurcating behind eye. Eye with black pupil, margined with fiery red. Dorsal and anal fins orange red, bases darker, with the basal median and axial rows of blue spots and the apical tip blue from the sharp spines. Summit color of fins blending gray violet and gray posteriorly on head. Front of dorsal fin with black central spot. Pectoral fin pale amber." (Tinkham.)

A species related to *Anampses caeruleo-punctatus* Rüppell, differing chiefly in coloration. Compared with Engel's colored figure, published by Bleeker as *Anampses coeruleopunctatus*¹² that is without a blue band along the post-maxillary groove, the dorsals sprinkled with very numerous small blue spots, a blue transverse line bordering the base of the dark transverse basal bar on the pectoral fin, blue bands on head greatly narrowed and line-like, or the head without any blue spot, also no trace of the blue bordering line on the under surface of the head. Garrett's figure, published by Günther as *Anampses coeruleomaculatus* in 1881 evidently from a Tahiti specimen, differs in not having the hind edge of the caudal pale blue, the pectoral without a dark basal bar but with its upper edge narrowly blue and the whole lower edge of the head and chest with a blue green border. Finally Regan has described *Anampses pulcher*¹³ with Searle's lithographs, which shows the spotted head quite differently marked from my specimen. The very small anterior predorsal scales are in agreement. The prepectoral and basal caudal scalation is also different from that as indicated by Engel and Garrett.

(For Captain Ernest R. Tinkham.)

***Stethojulis axillaris* (Quoy and Gaimard)**

In alcohol dark color of back resolves into 4 or 5 ill defined olivaceous blotches, greatly wider than narrow paler intervals. Bright crimson blotch above pectoral axil and forward and backward marks dividing line from olive color of head above and back, and below on head for orange of lower sides of head and crimson tinge for lower side of body. Iris crimson. Black spots, as one on upper front part of snout, one on posterior dorsal rays, one on posterior anal rays, and 3 to 5 on posterior or straight section of lateral line. Of last often posterior black spot is largest and most distinct and may be slightly elevated from middle of caudal base, and also a second blackish spot less distinct may occur below it. Vertical fins all more or less golden, dorsals and caudal tinged with brown. Nine, 23 to 50 mm., July 27.

¹² Atlas Ichth. Ind. Néerl., vol. 1, 1862, pl. 24, fig. 2.

¹³ Proc. Zool. Soc. London, 1913, p. 311, pls. 58, figs. 1, and 59 (type locality, Easter Island; Tahiti).

One, 18 mm., July 29; three, 18 to 37 mm., August 7. Color in alcohol all pale pink, with characteristic dark spots on tail. The young, when largely faded are usually easily identifiable by the black spot at the base of the last dorsal and anal rays, and another at the middle of the base of the caudal fin.

None of the above specimens with pale or whitish dots on the head, the black bar along the pectoral base or the 2 black spots at the caudal base, in same plane as shown in Mintern's colored figure as published by Günther in 1881. Morita's crude colored figure (2), published by Jordan and Seale in 1905 as *Stethojulis bandanensis* differs in having a red blotch behind the origin of the pectoral fin, but in all my specimens it is partly advanced from the pectoral fin origin.

Rhytejulis albovittata (Bonnaterre)

Color in alcohol with back olivaceous and lower half of side white. Iris crimson. Crimson violaceous line from near end of snout, over eye and along dorsal bases to caudal peduncle, at eye it dips on iris. Second crimson violaceous band from end of maxillary to and along lower eye edge, then back to opercular flap and slightly inclined down to middle of side. Arch of scarlet above pectoral base, turning scarlet violaceous behind to bound olive color of back far as bases of infero-median caudal rays. From each side of hind part of chin scarlet violaceous band arches up on cheek, then slopes back to edge of gill opening, after which it follows edge of gill opening to pectoral origin. Dorsals and caudal gamboge olive. Anal whitish. Paired fins golden, pectoral paler terminally. One, 83 mm., July 27.

Hemigymnus fasciatus (Bloch)

Figure 32.

One, 15 mm., July 29. Greatly like Speigler's colored figure, published by Bleeker as *Hemigymnus leucosmos* in 1862, based on his unique specimen 41" long. My specimen differs in detail as a much earlier stage and shows no trace of distinct scales below and behind the eye. Its coloration is white, contrasted with transverse blackish brown bands.

Hemigymnus melapterus (Bloch)

Color when fresh in alcohol with broad black area on trunk from second dorsal spine to vent and embracing rest of trunk and tail to caudal peduncle, which together with caudal fin is bright golden yellow. Head and front portion of trunk more or less soiled grayish. Lips and under surface of head white. Iris dark gray. Black blotch, size of pupil, close behind hind edge of eye. Paired fins whitish, also their axils. One, 100 mm., July 29.

Hemitautoga centriquadra (Lacépède)

Color when fresh in alcohol pinkish gray, lighter below. Iris crimson. Scarlet band from above end of snout to eye and beyond, also another along each side of front of head to occiput, besides an upper postocular band which may be broken as red spots. Scarlet band from mandible back towards pectoral origin. Lower postocular red band out over opercle. Many red spots scattered irregularly over predorsal. On most scales of trunk and tail

above scales bordered with blackish, forming reticulated design and many of lower ones incomplete or broken. Most of dorsals bright yellow, with this color invading back from third and fourth spines and from fourth to sixth rays as triangular blotch. Rest of dorsals over most of basal half largely brownish black, with at least 2 series of round yellow spots. Caudal and anal golden yellow, latter with row of subbasal red reticulations. Pectoral gray, yellow basally, with small black spot at origin and brown spot in axil. Ventral yellow. Red bar before pectoral base and another along edge of gill opening. One, 94 mm., July 27.

Guentheria trimaculata (Quoy and Gaimard)

Color when fresh in alcohol largely yellowish olive, each scale on body with darker olive to golden olive spot, on larger median lateral scales as vertical bars. Iris crimson. Crimson band from near end of snout to eye, and crimson band over suborbitals back to opercle. Median crimson band on mandible posteriorly to ventrals. Narrower crimson band parallel above to eye. Several crimson blotches on opercular flap and on opercle. Round black blotch on upper side of caudal peduncle above straight section of lateral line. Vertical fins brilliant golden orange. Edges of dorsals narrowly blue, with submarginal red band, rest of fin with many scarlet reticulating lines leaving rounded golden orange spots. Anal with basal and subbasal scarlet band forming row of golden basal spots. Caudal orange, upper and lower edges red. Paired fins golden, with small black spot at pectoral origin. Brilliant crimson band behind pectoral on abdomen, extends down till nearly level with ventral bases. Two, 90 to 94 mm., July 27.

"Living colors pale greenish white, with tail pale greenish blue. Peach colored markings below eye. Preocular stripe orange pink. Eye with black pupil, iris fiery orange, outwardly edged with pinkish green. Center of body viridian." (Tinkham.) One, 86 mm., September 5, north side of island.

Octocynodon margaritaceus (Valenciennes)

Color when fresh in alcohol with back and upper surfaces warm olive or olive buff, becoming pale yellowish white on under surfaces. End of snout brilliant scarlet orange. Iris with golden ring around pupil. Dark crimson band from side of snout to eye, then back over opercle, where expanded and expansion with central green spot. Small black spot in crimson band close before eye. Vertical black bar close before eye, intersecting short upper crimson dark horizontal band on opercle above. Two horizontal crimson bands on cheek. Top of head behind eye and back with many dark to blackish reticulations. Six ill defined dark blotches on back, mostly emphasized by small black spot. Three large blackish blotches on middle of side, median over twice size of others. Deep brown blotch before and below lower pectoral base large as eye. Axil of pectoral fin with brown spot, though all around base of fin white. Olive green triangular blotch extends downwards behind depressed pectoral, from interval between 2 black lateral blotches. From second large black blotch brilliant large carmine blotch down to vent. Dorsals golden orange, traversed by numerous transverse brown bands, inclined down and back, mostly forked above to edge of fin and all with dark bordering lines. At front of soft dorsal they give way to large black spot little less than eye, ringed with golden above and

orange below. Also another black spot, small, on first membrane of spinous dorsal. Anal chrome yellow, with transverse scarlet bands, each inclined or arched little forward. Caudal golden orange, and medially crossed by 7 transverse narrow scarlet bands. Paired fins orange. One, 88 mm., July 27.

The above differs in detail from Speigler's colored figure, published as *Halichoeres pseudominiatus* by Bleeker in 1862. The median ocellus on the dorsal fin is greatly smaller, the black lateral blotches connected as a black lateral band, no dark blotch is shown below the lower pectoral base and the markings on the head are quite different.

Halichoeres nigrescens (Schneider)

Figure 33.

Two, 15 to 20 mm., July 27.

Halichoeres sexmaculatus new species

Figure 34.

Depth $3\frac{1}{4}$; head $2\frac{3}{4}$, width $2\frac{1}{2}$. Snout (in profile) $4\frac{1}{2}$ in head, tip nearly level with lower rim of pupil; eye $3\frac{3}{4}$, greater than snout or interorbital; mouth cleft short, extends about half way to eye, slightly inclined and closed jaws even in front; pair of canines directed forward in front of each jaw; interorbital width 4, low, broadly convex. Gill opening extends forward opposite hind pupil of eye.

Tubular scales in lateral line 15, 12, 5; scales 3 above to front of spinous dorsal and 8 below to anal origin. Head scaleless. Predorsal scales 5. Fins scaleless, except caudal base. Scales little smaller on chest and breast than on middle of sides.

D. XI, 11, 1, spines little pungent, first long as snout, third ray 3 in head; A. III, 11, 1, third spine $3\frac{1}{2}$, third ray $2\frac{3}{4}$; least depth of caudal peduncle $2\frac{1}{4}$; caudal $1\frac{1}{2}$, little convex behind; pectoral $1\frac{3}{4}$, rays 1, 11; ventral rays I, 5, fin $2\frac{1}{2}$ in head.

Color in alcohol light yellowish, with a pinkish tinge on trunk. Brown shade across interorbital. Brown band from snout tip through eye back to opercle. Iris pink, with edge of eyeball blue gray. On back 7 dark brown blotches, first at front of predorsal, second to fourth to below spinous dorsal and fifth to seventh below soft dorsal. Along axis of trunk and tail 6 dark brown blotches with last at middle of caudal base. Several brown spots on sides of abdomen. Vertical fins whitish, with pink tinge. Black blotch and front of spinous dorsal on first two membranes medially black, also another on last 2 membranes subbasally. Soft dorsal with submarginal black line and 3 subbasal dark brown blotches. Anal with large brown submarginal line. Paired fins whitish.

A.N.S.P., no. 72042. Aguni Shima, Riu Kiu Islands. July 27. Length 26 mm. Type.

Only the type secured. Apparently distinct in the median lateral row of 6 dark brown spots, the last at the caudal base, in combination with the other color markings. It approaches the imperfectly described *PlatyGLOSSUS tenuispinis* Günther¹⁴ based on a specimen 132 mm. long. It differs, how-

¹⁴ Cat. Fishes Brit. Mus., vol. 4, 1862, p. 161 (type locality, China).

ever, in having "a black spot superiorly in the axil" evidently with reference to the pectoral fin.

(*sex six + maculatus* spotted.)

Platyglossus notopsis (Kuhl and Van Hasselt)

Figure 35.

One, 21 mm., July 25; four, 15 to 23 mm., July 27; one, 27 mm., August 2; two, 25 to 29 mm., August 7. Most all from pools. Of July 27 specimens one figured differs in absence of the ocellus on soft dorsal. Another with same data (15 mm.) has 2 white blotches at dorsal base, one midway and the other at soft dorsal, besides a third as saddle on caudal peduncle above.

My specimens agree largely with Speigler's colored figure, published by Bleeker as *Platyglossus notopsis* in 1862. They show the pale areas far more vivid pearly white and the darker areas blackish olive to nearly black.

Hologymnosus semidiscus (Lacépède)

Color when fresh in alcohol pale brown on back and sides, with greenish yellow tinge on side of head and flanks. Iris crimson. Narrow reddish brown band from front part of snout, above eye and along dorsal bases. Second or axial olive brown band from near end of snout to eye and back over side of head to pass supra-median caudal rays and broken more or less in its posterior course. Third broader band from mandible to pectoral base and thence to supra-median caudal rays. On body all longitudinal bands with more or less diffuse and indistinctly defined dark spots, also 5 less defined transverse diffuse darker cross bars. Black spot in opercular flap where axial lateral band crosses. Dorsals brilliant orange red. Caudal greenish yellow above, lower lesser area orange red. Anal bright orange red. Paired fins orange. One, 87 mm., July 27.

"Living colors olive, with olive brown vertical stripe on body. Eye with pupil black and iris crimson lake. Dorsal and ventral fins rose pink. Pale viridian around head and pink violet ventral just caudad of gills." (Tinkham.) One, 130 mm., September 5. It shows 20 dark brown vertical bands, equidistant and each little narrower than pale interspaces.

Thalassoma quinquevittatum (Lay and Bennett)

Color when fresh in alcohol greenish yellow above, under surfaces of body pinkish. Deep maroon brown band from interorbital, dividing each side of predorsal and extends along bases of dorsals. A second similar colored axial band starts near end of snout to eye, where crimson, then passes to middle of base of upper caudal lobe. Both of these bands throughout their course on body, give off regularly in each scale juncture an upper and lower extension or line, so that in interval between maroon brown bands they are connected. Transverse crimson bar across lower chin. Iris largely crimson. Dorsals greenish yellow, with broad upper red border and median mauve longitudinal band forming black blotch on second and third membranes of spinous fin and posteriorly on soft dorsal becomes sub-basal. Anal with lower border red, median longitudinal band brilliant chrome yellow and basal band purplish brown. Caudal golden yellow, hind edge tinged with red and basally large blackish brown blotch, which is more

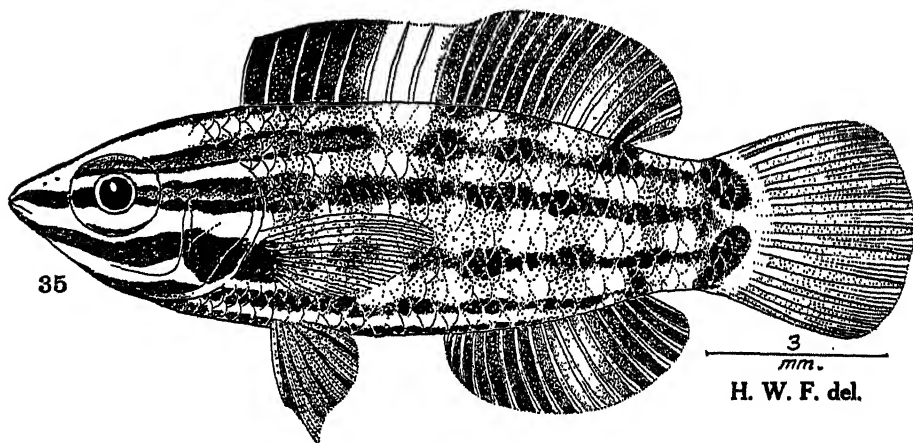
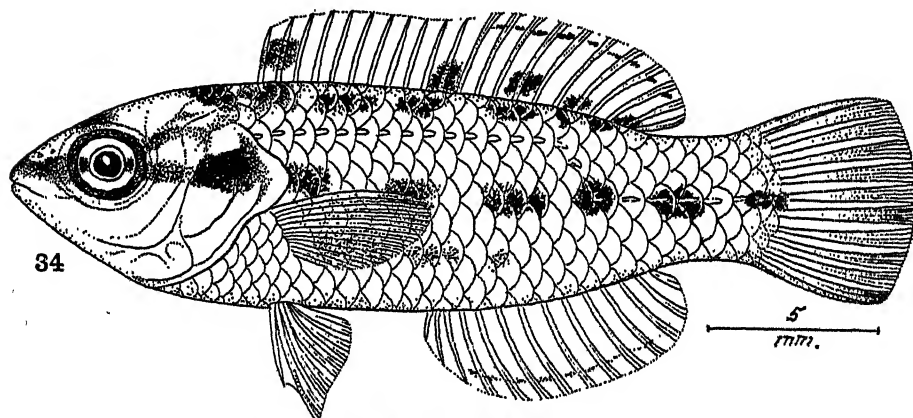
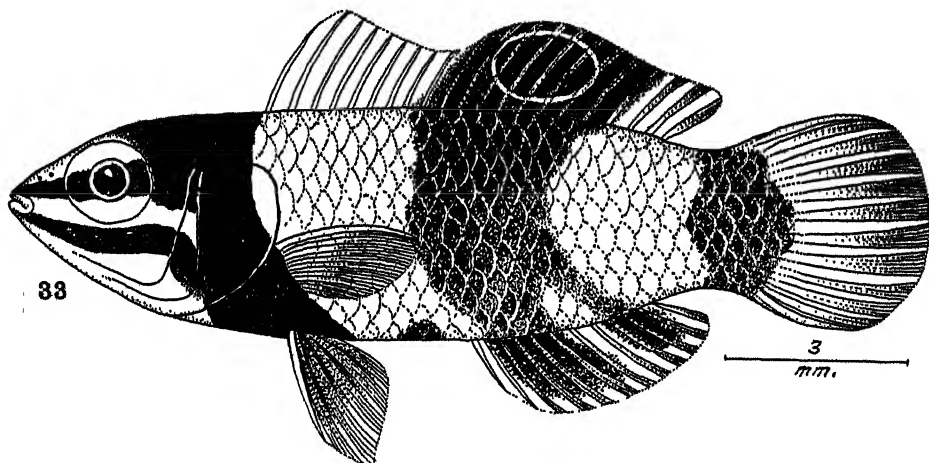


Fig. 33.—*Halichoeres nigrescens* (Schneider).

Fig. 34.—*Halichoeres sexmaculatus* new species.

Fig. 35.—*PlatyGLOSSUS notopsis* (Kuhl and Van Hasselt).

or less with diffuse red edge extending forward along edges of caudal peduncle. Pectoral orange red, axil orange, outer base with black spot at origin and rest of base crimson, fin also with large terminal upper black spot. Ventral salmon color. One, 73 mm., July 27.

Speigler's colored figure, published by Bleeker as *Julis guntheri* in 1862 may be the present species, but it does not show red borders to either the dorsal or anal fins and the latter is without the dark or mauve basal band.

Thalassoma lutescens (Solander)

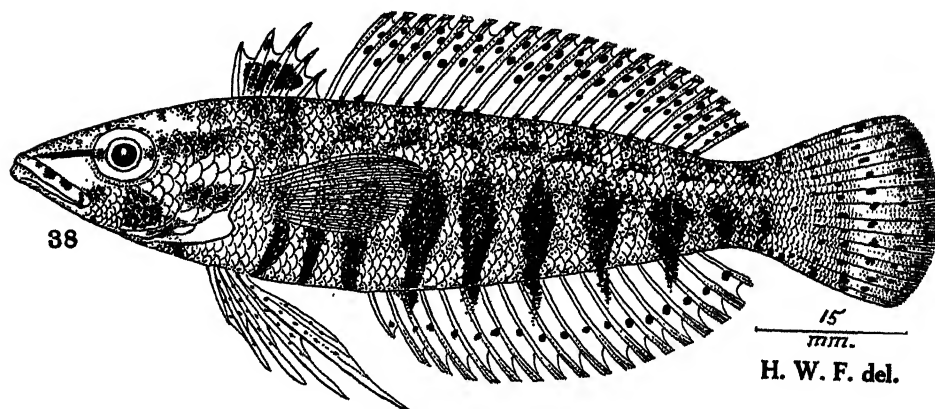
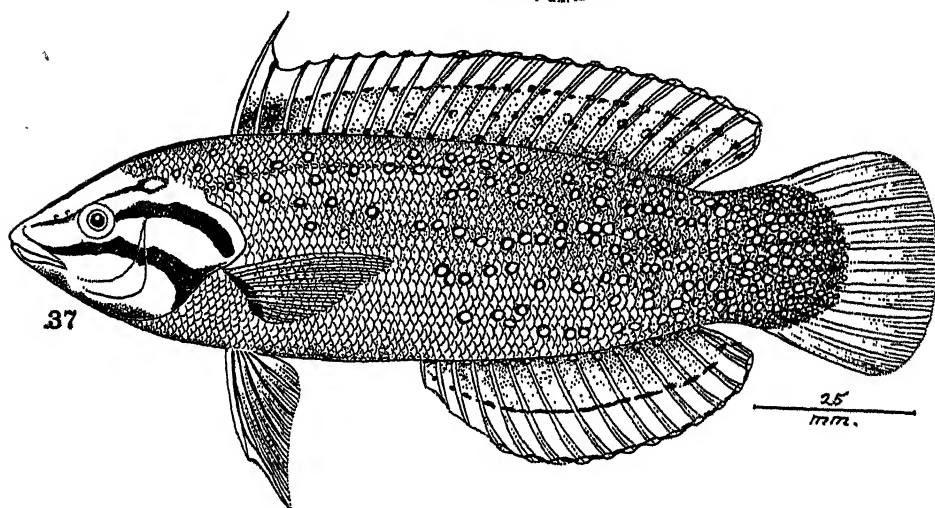
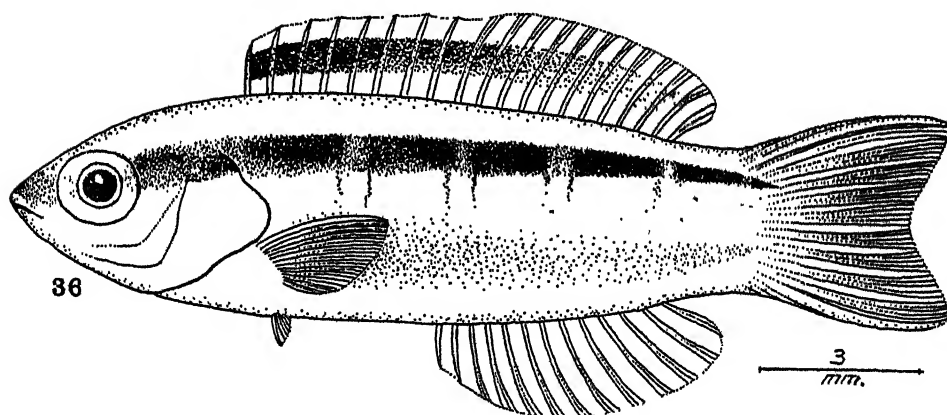
Figure 36.

Depth 4. Scales $21 + 5$, 2 in lateral line; 4 predorsal. D. VIII, 13. In alcohol black lateral band from snout includes front edge of mandible, back and crosses hind section of lateral line back to bases of supra-median caudal rays, but ending in a strongly contrasted black spot. Above olive and edge of back, all along dorsal bases, blackish. Lower surface, below black lateral band, pearly white, with pale rose tinge on lower side of head and flanks, and posteriorly with faint lilac spot on each of bordering scales. Iris dark brown. Dorsals dark gray, broadly bordered with whitish. Anal and caudal brilliant orange, with somewhat vermilion tinge basally. Pectoral pale yellowish, with small black spot, which also extends in axil at fin origin. Ventral white. Three, 15 to 20 mm., July 25; two, 14 to 18 mm., July 27; two, 15 to 29 mm., July 28; one, 25 mm., August 2; three, 17 to 23 mm., August 17; three, 17 to 41 mm., September 17. These all appear to be the young of the present species as they have a slender body and a black spot at the origin of the pectoral fin.

Color when fresh in alcohol with top of head from interorbital space back along dorsal bases as a blackish brown band. Below and adjoining gray white band from front of interorbital space back to include upper edge of caudal peduncle and reaching into orange of caudal base. Black lateral band prominent from end of snout, including upper lip and also tip of lower lip, to supra-median base of caudal, and below for its whole extent it adjoins narrower pale rosy crimson band, below this head and body white. Iris grayish, except as crossed by black longitudinal band. Dorsals largely blackish brown, terminally outer half of second dorsal whitish. Anal yellow, base orange. Pectoral grayish, white basally and small black spot at origin, axil of fin pale. Ventral yellowish. One, 29 mm., August 2, in pool. Preopercle scaleless, black lateral band not ending in a black spot as in my figure of a young *Thalassoma duperrey* (Quoy and Gaimard).¹⁵

Color when fresh in alcohol olivaceous, slightly more yellowish on sides. Each scale exposure on back with an olive blotch and on the sides as the exposures are deeper than long, olive markings vertically diamond shaped. Three yellowish green lines from mouth to eye and posterior to eye expand as broader yellowish green bands, also 2 broad ones arch on lower side of head and then continue on side of chest and breast. Iris gray, with yellow ring around pupil. Dorsals bright greenish yellow, with median longitudinal orange red band, bordered by a dark gray line each side. Anal greenish yellow, with broad basal orange red band, its lower border a dark gray line. Caudal bright greenish yellow, with broad orange red submarginal band above and below, outer edges of each narrowly pale blue. Pectoral with

¹⁵ Mem. B. P. Bishop Mus., vol. 11, no. 5, 1931, p. 357, fig. 5 (Honolulu).



H. W. F. del.

Fig. 36.—*Thalassoma lutescens* (Solander).
Fig. 37.—*Julius gaimard speciosa* new subspecies.
Fig. 38.—*Chilias synaphodesmus* new species.

basal half greenish yellow, outer marginal half gray and becomes black above to form a black subterminal blotch. Ventral yellowish basally, grayish terminally. One, 132 mm., July 27.

The young show great superficial resemblance to *Pseudojulis trifasciatus* Weber,¹⁶ though such resemblance only one of color pattern. Comparison of the young specimens of the present species is afforded by similar young specimens of the Hawaiian *Thalassoma duperry* in which the black caudal spot is present, and they differ further in the presence of 2 darker or blackish longitudinal bands, the uppermost of which embraces the entire basal portions of the dorsal fins.

Thalassoma hardwicke (Bennett)

Color in alcohol with back olive green, crossed by 6 gray black transverse bands or like blotches and slightly inclined back. Two crimson purple blotches on upper hind part of head, angular band across interorbital with apex forward, blotch from side of snout to eye, one on preorbital and 2 oblique bars down from eye posteriorly with upper ending as spot on edge of gill opening. Oblique crimson bar along before pectoral base. Under surfaces of body white. Axial crimson violet diffuse band on side of body, best defined on tail. Dorsals greenish yellow, with median longitudinal violaceous band. Caudal greenish yellow, submarginally above and below reddish band and edges narrowly olivaceous. Anal orange yellow, with short medial dark gray bar. Paired fins golden yellow, with small black spot at pectoral origin. One, 112 mm., July 27.

Julis gaimard speciosa new subspecies

Figure 37.

Depth $3\frac{1}{2}$ to $3\frac{3}{4}$; head $3\frac{1}{2}$ to $3\frac{3}{4}$, width $2\frac{1}{2}$ to $2\frac{3}{4}$. Snout (in profile) $3\frac{1}{2}$ to $3\frac{3}{4}$ in head, tip level with lower edge of eye; eye 6 to $6\frac{1}{2}$, $1\frac{1}{2}$ to $1\frac{3}{4}$ in snout, $1\frac{1}{4}$ to $1\frac{1}{2}$ in interorbital; mouth reaches about $\frac{2}{3}$ to eye, closed jaws even in front, with lower front canines more or less exposed; front canines long, slender, curved, other teeth graduated shorter posteriorly; interorbital width $4\frac{1}{2}$ to $4\frac{3}{4}$, convexly elevated. Gill opening extends forward opposite hind edge of eye. Gill rakers 5 + 9, lanceolate, $\frac{1}{2}$ of gill filaments, which are $1\frac{1}{2}$ in eye.

Scales 52, 6, 13, 3 (= 74) in lateral line; 6 above lateral line to spinous dorsal origin, 30 below to anal origin; 15 predorsal. Head scaleless. Caudal with nearly basal half scaly, otherwise fins naked. Scales all more or less uniformly small. No enlarged axillary ventral scale.

D. VIII, 13, 1, first spine $1\frac{1}{2}$ to $2\frac{1}{10}$ in head, first ray $2\frac{1}{10}$ to $2\frac{3}{5}$; A. III, 12, 1, third spine $3\frac{3}{8}$ to 4, third ray 2 to $2\frac{1}{5}$; caudal peduncle $1\frac{1}{2}$ to $2\frac{1}{10}$; caudal $1\frac{1}{2}$ to $1\frac{3}{4}$, hind edge convex; pectoral $1\frac{1}{2}$ to $1\frac{3}{4}$, rays 1, 11 to 14; ventral I, 5, fin $1\frac{1}{2}$ to $1\frac{3}{4}$ in head.

Color when fresh in alcohol brilliant orange, muzzle reddish, lips bright orange red and iris scarlet. Lower front cheek brilliant scarlet. Median dark olive narrow band from front part of snout to dorsal. Brilliant maroon band, begins little before nostril and opposite beginning of predorsal band, back to upper eye edge, then up to front of dorsal. Broad postocular maroon

¹⁶ *Pseudojulops* Fowler, Proc. Acad. Nat. Sci. Phila., 1941, p. 271. Type *Pseudojulis trifasciatus* Weber.

band back into lobe of opercle. Brilliant crimson maroon band from angle of mouth up to edge of orbit, then becomes brilliant violaceous and broadens on edge of gill opening. Along lower side of head each side a narrow dark maroon band and between them a median dark green narrow band; all 3 bands continue back over breast, each of lateral close above ventral base and even well back towards anal, while green median one not extended beyond ventrals. Trunk rich olive brown, with more or less crimson glow and posteriorly tail becomes dark olive brown, this dark color invading the caudal to its middle. Dorsals brilliant scarlet, with olive tinge basally; upper margin of fin very narrowly blue white, with narrow submarginal gray black line. On spinous dorsal a deep crimson longitudinal narrow band, on soft dorsal followed by a row of bright cobalt blue small spots, ocellated narrowly with deep blue; entire bases of both fins with row of large blue ocelli, and between them and row above also row of similar ocelli on soft dorsal. Anal dark crimson with tinge of olivaceous; margin of fin brilliant cobalt blue, tip of each spine and ray blue white; fin with median row of blue ocelli and another basally. On all dark color of trunk and tail numerous bright cobalt blue ocelli, the rings narrowly dark blue, and ocelli sparse on trunk but become numerous on tail and are greatly crowded posteriorly, especially on caudal basally. Otherwise than noted the caudal is brilliant golden yellow. Pectoral with base and axil gray black, defined behind by a green bar, fin bright scarlet over basal half and becomes brilliant golden on terminal half. Ventral largely scarlet, golden terminally and edged narrowly blue in front.

A.N.S.P., no. 72044. Aguni Shima, Riu Kiu Islands. July 27. Length 140 mm. Type.

A.N.S.P., no. 72045. Same data as type. Length 122 mm. Paratype.

Closely related to the Hawaiian *Julis gaimard* Quoy and Gaimard, from which it appears to be distinguished by details of coloration, especially the dark longitudinal lines on the dorsal and anal fins, and the disposition of the bands on the head.

(*speciosus* beautiful.)

Gomphosus varius Lacépède

Color when fresh in alcohol with head and belly brilliant rose red, snout tinged with orange. Iris brown. Cranium or head posteriorly, trunk above and tail largely olive, becoming blackish posteriorly and over most of vertical fins. Each scale on sides and above with round black spot. Narrow edges of soft dorsal and anal red, latter fin with median row of orange yellow spots, one on each membrane. Caudal blackish brown, with broad posterior border of pink and submargin of yellow. One, 141 mm., July 27.

Pseudocheilinus hexataenia (Bleeker)

Two, 65 to 68 mm., August 7, in pools. Brilliant like Morita's painting, published by Jordan and Seale in 1906 from a Samoan specimen. On the snout, however, the dark blue lines are more as rings and arcs, also the head and breast are more or less yellow. The body and vertical fins are brilliant blue green.

SCARIDAE***Scarus erythrodon* (Valenciennes)**

Color in alcohol when fresh dark brown, with slightly paler caudal peduncle, leaving large diffuse dark blotch on squamous area basally on caudal fin. Chest and breast with dull dark crimson suffusion. Iris crimson. Posterior part of lips, mandible and under surface of head suffused with dull red. Dorsals and anals dark gray. Caudal basally paler brown, terminally blackish brown. Pectoral olive greenish, basally brown. Ventral dark reddish gray, rays blackish. One, 108 mm., July 27. It has but 2 rows of scales on cheek, none on preopercle flange.

CIRRHITIDAE***Paracirrhites forsteri* (Schneider)**

"Living colors with head olive green above, violet gray below marked with dark verona brown spots. Longitudinal yellow band extends on body, verona brown above and golden brown below with longitudinal stripes. Pupil of eye black, finely edged with gold and garnet red, and violaceous gray on outer edges. Dorsal fin uniform, inferiorly orange along base. Tail with pale wine brown cast." (Tinkham.) When fresh in alcohol whole dorsal base crimson scarlet, also all of caudal. One, 150 mm., September 6.

BLENNIIDAE***Cirripectes variolosus* (Valenciennes)**

D. XI or XII, 14 or 14, 1; A. II, 15, 1. Transverse row of occipital cirri about 30 filaments. Supraorbital tentacle with 4 or 5 filaments.

Color when fresh in alcohol blackish brown or nearly blackish, side of body in smaller specimen with about 12 or more obsolete, parallel, equidistant, vertical blackish bands, narrowing below. Black blotch size of pupil at front of interorbital space. Two black bars from lower edge of eye, first over preorbital and second broader over infraorbital. Iris with crimson tinge. Three ill defined or diffuse black bands across lower surface of head. Dorsals largely uniform blackish brown, first spine long as head and last about long as eye, and bright golden orange area begins from near base of first spine, slopes up to leave only very narrow ends of last spines golden yellow, also narrow border of same color anteriorly on second dorsal. Caudal black, with broad upper hind border yellow. Anal black, end of each ray dark gray. Pectoral bright olive green on rays, membrane grayish. Ventral gray black. Two, 98 to 100 mm., July 27. Larger specimen with white on upper front border of first dorsal distinct and contrasted with rest of dark color.

***Cirripectes reticulatus* new species**

Figure 39.

Depth $3\frac{1}{2}$; head $3\frac{1}{2}$, width $1\frac{1}{2}$. Snout (in subvertical profile) $3\frac{1}{2}$ in head; eye $3\frac{1}{2}$, 1 in snout, greatly exceeds interorbital; mouth low, nearly horizontal, closed jaws with lower slightly included; lips fleshy, upper broad with fringed edge; strong short lower canine each side; teeth very close set, movable, uniform, numerous; interorbital deeply concave, narrow, its bony width $\frac{1}{3}$ of orbit. Gill opening forms broad free fold over broad isthmus.

Lateral line continuous, pores more numerous on arch which extends over depressed pectoral, then falls to middle of side of tail where more or less disconnected. Transverse fringe of occiput with about 30 filaments. Supraorbital flap and front nasal flap each with fringe of 5 points.

D. XI, 13, first spine longest or $1\frac{1}{2}$ in head, fin deeply notched, first ray $1\frac{1}{2}$; A. II, 14, 1, second spine $4\frac{1}{2}$, first embedded in thick spongy integument, sixth membrane $1\frac{1}{2}$ and membrane behind tip of each ray deeply notched; least depth of caudal peduncle 2; caudal $1\frac{1}{10}$, convex behind; pectoral subequal with head, rays 16, with ends of membranes of lowest 5 deeply notched; ventral $1\frac{1}{2}$, rays 2.

Color when fresh in alcohol dark blackish brown, with general blackish appearance. Whole side of trunk and tail with underlaid obscure paler spots all larger than narrower resulting reticulations. Upper front edge of first dorsal pale gray to white, though limitation of pale color not sparsely contrasted and not extended much beyond middle of marginal length. Second dorsal entirely black. Caudal with upper hind marginal area broadly yellowish and entire fin more or less suffused with olivaceous. Pectoral gray black. Ventral blackish.

A.N.S.P., no. 72043. Aguni Shima, Riu Kiu Islands. July 27. Length 87 mm. Type.

A species known chiefly by its coloration, composed of pale spots formed by dark reticulations. No trace of the dark ocellus on the opercle and the small scattered spots on the body as shown in Mintern's lithograph and published by Günther as *Salarias variolosus* in 1877.

(*reticulatus* netted, with reference to the markings.)

SCARTOBLENNIUS new genus

TYPE.—*Blennius ellipes* Jordan and Starks.

Body moderately long, compressed. Head moderate, with front profile subvertical. Mouth broad. Teeth uniserial, close set, pointed, only slightly movable. Pair of lower canines present. Supraorbital tentacle slender, simple, longer than eye. Interorbital narrowly concave. Gill opening extensive, forms free fold across broad isthmus. Dorsals continuous, without evident notch separating front and posterior fins. Caudal free. Dark bar at pectoral base and one along edge of gill opening.

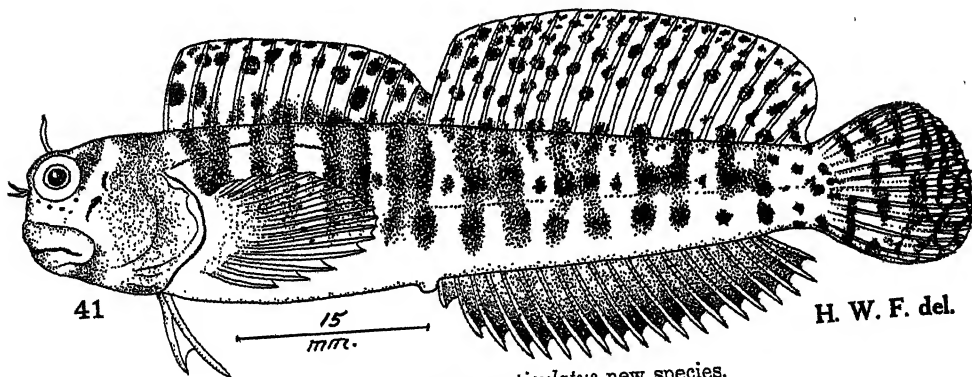
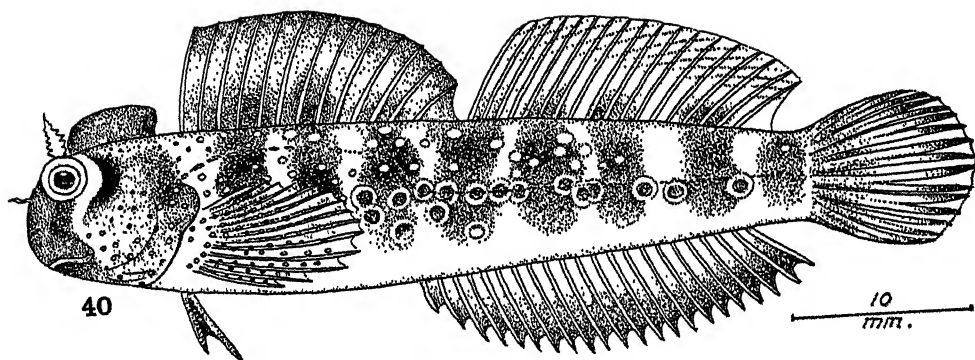
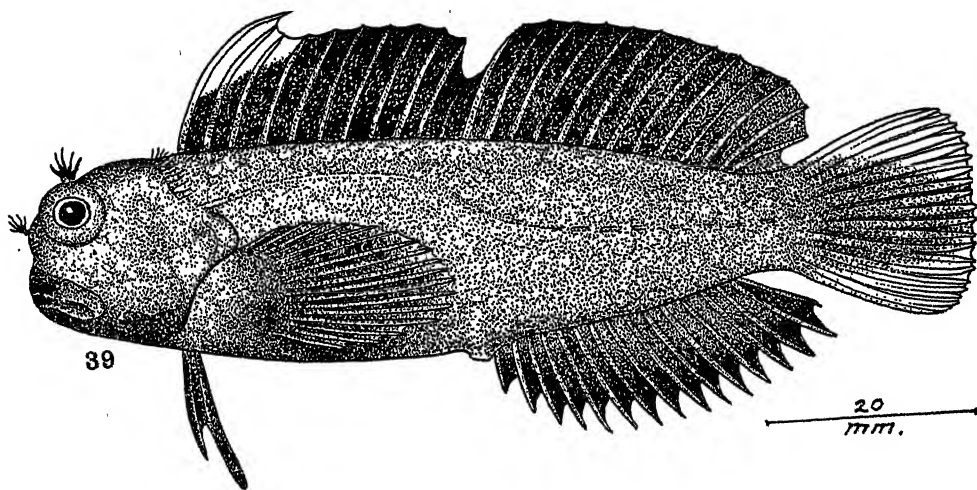
A genus allied with *Blennius* Linnaeus but with the teeth slightly movable, body slender, long supraorbital tentacle and the coloration distinctive.

(σκάπτῃς one who leaps + *Blennius*.)

Scartoblennius ellipes (Jordan and Starks)

Depth 5 to $5\frac{1}{2}$; head $4\frac{1}{2}$ to 5. Supraorbital tentacle long, $1\frac{1}{2}$ times eye. D. X or XI, 19 to 22; A. II, 20 to 22.

Color when fresh in alcohol very pale buff brown, with 7 broad transverse dark brown blotches, broader than pale interspaces and between first pair dark blotch on costal region. Head brown, little darker than body, sometimes deep drab gray; marked with few gray blue dark bordered ocelli on cheek, and 2 transverse dark bars crossing lower surface of head, first median and other from gill opening. Iris gray. Dark blotches on



H. W. F. del.

Fig. 39.—*Cirripectes reticulatus* new species.
 Fig. 40.—*Salaria schmidtii* new species.
 Fig. 41.—*Salaria brevoorti* new species.

dorsal fin bases and on back above, each one with several dark brown arcs or irregular horizontal lines; also over whole side of body many short blue horizontal bars or spots, all with dark bordering lines. Dorsals pale or whitish but with median dark band, ill defined, at first blackish and delimiting dark reflections from dark body blotches; on second dorsal fin within reflections some dark bars inclined upward and backward. Caudal grayish, pale basally, each membrane with several whitish spots. Anal whitish, rather broadly gray terminally. Pectoral pale buff, with dark transverse basal line and another anteriorly to base of ventral. Ventrals dark gray. Four, 55 to 58 mm., August 7, in pools.

Salarias fasciatus (Bloch)

Color in alcohol with row of 6 small blue spots close along upper arch of lateral line, but none on lower surface of body. Broad transverse dark brown band across under surface of head, and narrow dark line along edge of gill fold across branchial region. Two narrow transverse dark brown bands across chest, anterior at bases of ventrals. Three, 45 to 125 mm., July 27. Smaller specimens with D. XII, 12; A. I, 20.

Bloch's original figure of his *Blennius fasciatus* is very crude, showing 4 dark transverse bands on the tail, while those on the trunk above if computed in pairs would indicate 3 more. All extend on the dorsals and those on the tail reach out over the anal, in all cases to the fin edges. Except as some fine dark close set lines on side of back, longitudinal dark bands are absent.

Salarias schmidti new species

Figure 40.

Depth $4\frac{3}{8}$ to 5; head 4 to $4\frac{1}{2}$, width $1\frac{3}{8}$ to $1\frac{1}{2}$. Snout with front profile vertically convex, length to eye $2\frac{1}{2}$ to $3\frac{1}{2}$ in head; eye 3 to $3\frac{1}{2}$ in greatest length of head, $1\frac{1}{2}$ to greater in snout, greatly exceeds interorbital; mouth low, horizontal, as closed lower jaw included; maxillary reaches back opposite hind edge of eye, length (in profile) 3 in head as measured from snout tip; both lips with entire edges; teeth closely set, rather stiff though flexible, form compact edge; pair of lower canines; interorbital about half of eye diameter, deeply concave. Gill opening forms broad free fold or membrane over broad isthmus.

Skin smooth. Adult with pointed, compressed supraocular flap longer than eye, edges slightly fringed. Rather high median occipital flap begins opposite middle of eye and extends $\frac{4}{5}$ to first dorsal spine. Front nostril with short simple tentacle. No nuchal filament. Lateral line incomplete, only as anterior elevated arched extent above depressed pectoral.

D. XIII—18, first spine $1\frac{1}{2}$ in head, fin deeply notched and separated from soft dorsal (connected at base in paratype), first ray $1\frac{1}{2}$ and last ray not connected with caudal fin; A. II, 20, fin height $1\frac{1}{2}$, edges of membranes deeply notched; least depth of caudal peduncle 2; caudal 1, convexly rounded behind; pectoral $1\frac{1}{10}$, rays 14; ventral rays 2, fin $1\frac{1}{2}$ in head.

Color when fresh in alcohol dark olive brown, with 9 rather variable diffuse darker blotches on body and reflected indistinctly on dark bases of dorsals. On trunk above rather numerous scattered dark gray blue spots, with lighter ocellated blue borders, and on tail fewer spots but slightly larger.

Dark diffuse to nearly black bar below eye, another on postocular and finally one above opercle; dark postocular bar with gray line along front edge. Sides and under surface of head dark to gray black, with numerous small black spots ocellated with blue. First dorsal with numerous small inconspicuous blue spots, general appearance of fin blackish. Second dorsal blackish basally, dark brown terminally where very numerous small bright blue spots, and basal $\frac{3}{4}$ of fin with many inclined blue bars or lines, but not crossing fin rays. Anal gray black terminally, basally little paler. Caudal dark gray, with broad blackish submargin and diffuse dark brown transverse subbasal bar. Pectoral gray brown, with small blue basal spots. Ventral blackish brown.

A.N.S.P., no. 72046. Aguni Shima, Riu Kiu Islands. August 7. Length 55 mm. Type.

A.N.S.P., no. 72047. Same locality as type. July 29. Length 28 mm. Paratype. This small specimen agrees largely with the type in coloration. It shows the 9 transverse dark blotches, of which 2 are on the head but all are more or less variable. The specimen further agrees in its dark olive brown coloration and more or less blackish fins. The caudal is whitish all around the posterior border. No supraorbital flaps or median occipital cutaneous keel. Apparently no ocelli or spots on head and body.

(For Dr. P. J. Schmidt, of Leningrad, whose valued work on the Fishes of the Riu Kiu Islands 1930 has been of great assistance in the present study.)

Salarias novemaculosus (Snyder)

One, 44 mm., August 7, in pool. Compared with Atkinson's drawing as published by Snyder in 1912, the present specimen shows the similar median cutaneous ridge and supraorbital tentacle. Its coloration differs as it has 2 gray blue spots, one above the other, on the postocular; the first dorsal with only several rather large dark spots posteriorly; second dorsal with 3 or 4 close set dark gray longitudinal submarginal lines and 6 blackish well spaced lines from its base well inclined across fin rays. As viewed from below, and apparently not indicated in the figure, my specimen with brown edge to lower lip, a broad median transverse diffuse dark band, brown bar from edges of gill openings and constricted in the middle, besides short brown bar before and another behind bases of ventrals.

Salarias brevoorti new species

Figure 41.

Depth $4\frac{1}{2}$; head $4\frac{2}{3}$, width $1\frac{1}{2}$. Snout $3\frac{1}{2}$ in head, front profile nearly vertical; eye $3\frac{1}{2}$, $1\frac{1}{2}$ in snout, greatly exceeds interorbital; mouth nearly horizontal, closed jaws with lower included; maxillary $2\frac{1}{2}$ in head, reaches back slightly behind hind eye edge; lips entire; teeth fine, slender, flexible, closely set; pair of small lower canines; interorbital width 2 in eye, deeply concave. Gill opening with membrane forming rather broad free fold over broad isthmus.

Skin smooth. Simple supraocular tentacle slightly longer than eye. Front nostril with bifid tentacle, shorter than eye. Top of head with very low occipital keel, scarcely or not defined in lateral view. Lateral line incomplete, as short arch above depressed pectoral fin.

D. XII, 20, notch moderate, first spine $2\frac{1}{10}$ in head, fifth ray $1\frac{1}{2}$, last ray joined to caudal peduncle by a membrane but not to caudal fin; A. II, 19, fifth ray $1\frac{1}{2}$, lower edge of fin with margin of each membrane well notched; least depth of caudal peduncle $2\frac{1}{10}$; caudal $1\frac{1}{3}$, convexly rounded behind; pectoral 1, rays 14; ventral $1\frac{3}{8}$, rays 2.

Color when fresh in alcohol drab, paler on tail posteriorly. Head dull brown above, dark drab below. Two blue postocular bars, little inclined and one above the other. An indistinct brown band from hind eye edge inclined upward. Iris gray. Eight dark gray transverse bars on body, on tail mostly double or formed like letter H and in most of pale intervals dark spots, more numerous or defined about caudal base. Dark transverse bars also reflected slightly along dorsal fin bases. Dorsals whitish, first fin with more or less dark submarginal line and 2 irregular rows of large black spots, mostly on spines. Second dorsal with submarginal row of dark spots and 3 or 4 other rows of dark to black spots. Caudal whitish, with 5 transverse waved blackish bands. Anal grayish, darker to blackish submarginally leaving tips of rays white, also some irregular dark spots scattered basally. Paired fins whitish.

A.N.S.P., no. 72048. Aguni Shima, Riu Kiu Islands. August 7, in pool. Length 74 mm.

Only the type secured, representing a species with distinctive coloration and structural characters, especially its simple supraorbital tentacle and free caudal fin.

(For J. C. Brevoort, who reported Riu Kiu fishes in 1856, obtained by Commodore M. C. Perry's Expedition to Japan.)

Salarias lacunicola new species

Figures 41a and 42 (head above).

Depth $4\frac{1}{8}$; head $4\frac{1}{10}$, width $1\frac{1}{2}$. Snout (in profile) $2\frac{1}{2}$ in head, its front profile subvertical or but little inclined from vertical; eye elevated, slightly entering upper profile, $3\frac{3}{8}$ in head, $1\frac{1}{2}$ in snout, greatly exceeding interorbital; mouth low, horizontal, closed jaws with lower included; maxillary extends back opposite hind eye edge, length $2\frac{3}{8}$ in head; lips entire; teeth minute, close set, flexibly inserted; pair of strong though small, robust, recurved lower canines; bony interorbital deeply concave, width about half of eye diameter. Gill opening with broad free membrane over broad isthmus.

Skin smooth. A simple slender supraorbital tentacle, shorter than eye. Front nostril with short fleshy flap. Lateral line incomplete, as short arch above depressed pectoral fin.

D. XII, 14, notch deep though two fins not entirely separated, first spine 2 in head, third ray $1\frac{1}{2}$, last ray joined to caudal peduncle by membrane but not to caudal fin; A. II, 14, fifth ray 2 in head, lower edge of fin with each membrane notched behind tip of ray; least depth of caudal peduncle 2; caudal $1\frac{1}{3}$, hind edge convex; pectoral 1, rays 14; ventral rays 2, fin $1\frac{1}{2}$ in head.

Color when fresh in alcohol warm brownish, inclining to buff white below. Seven transverse dark brown cross bars, as pairs of close set bars or bands and all more or less russet below, but hardly reflected on bases of dorsals above. Iris pearly gray. Blue black postocular spot. Diffuse brown bar crosses under surface of head, extends as dark reticulations on cheek. Fins transparent to whitish. First dorsal with an inferior median longitudinal gray band. Second dorsal with each ray marked with 1 or 2 subbasal dark spots and others less defined above. Caudal pale, with yellowish tinge basally and on caudal peduncle. Anal more or less grayish. Paired fins colorless.

A.N.S.P., no. 72049. Aguni Shima, Riu Kiu Islands. August 7, in pool. Length 28 mm. Type.

Only the type secured. Apparently distinct in its low number of fin rays and the coloration.

(*lacuna* pool + *incola* inhabitant.)

Salarias luctuosus Whitley

Salarias luctuosus Whitley, Records Austral. Mus., vol. 7, no. 3, June 27, 1929, p. 136 (on Jordan and Starks).

Salarias andersoni (not *Salarias andersonii* Day, 1876) Jordan and Starks. Proc. U. S. Nat. Mus., vol. 30, 1906, p. 703, fig. 11 (type locality, Tanegashima, Japan).

One, 28 mm., July 27.

Salarias aureo-puncticeps new species

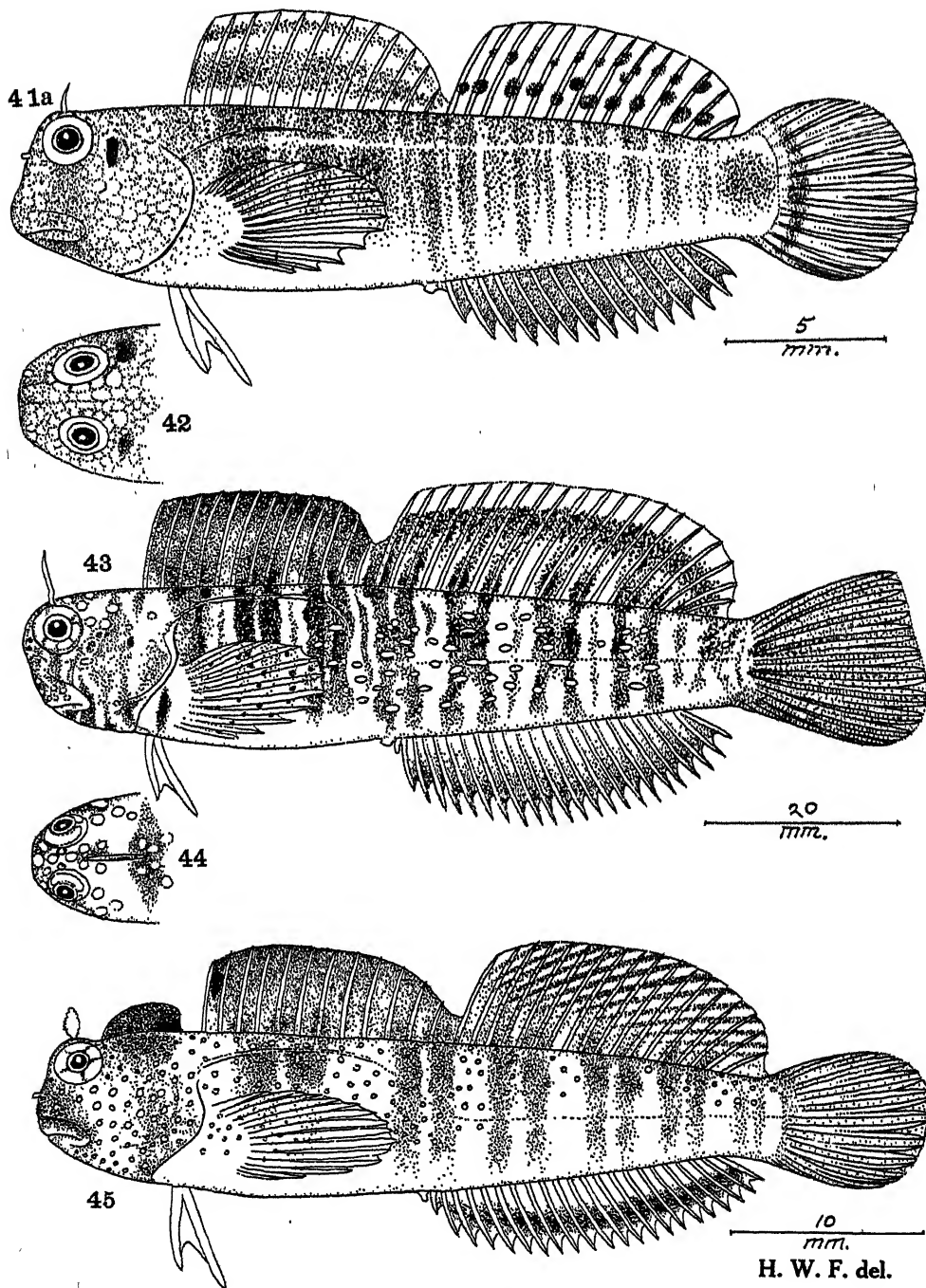
Figures 43 and 44 (head above).

Depth $4\frac{1}{2}$; head $4\frac{1}{2}$, width $1\frac{1}{2}$. Snout (in profile) $2\frac{3}{4}$ in head measured in greatest length from before eye to hind edge of gill opening, its front profile inclined down and inward; eye 3, $1\frac{1}{2}$ in snout, greatly exceeds inter-orbital; mouth inferior, low, closed lower jaw with front end opposite front edge of pupil; maxillary extends back beyond eye, length in profile $3\frac{1}{4}$ in head as measured above; upper lip nearly entire, or only very feebly or imperfectly crenulated; teeth very fine, close set, flexible; pair of short, strong, recurved lower canines; bony interorbital width $2\frac{1}{2}$ in eye, deeply concave. Gill opening with membrane forming broad free fold over wide isthmus.

Skin smooth, rather firm. A simple supraorbital tentacle, little longer than eye. No nasal flap, close set nostrils as 2 simple pores. Lateral line arched high over depressed pectoral, extends till only below last part of spinous dorsal.

D. XIII, 20, fin notched half way down with spinous fin little lower than soft fin, first spine $1\frac{3}{4}$ in greatest head length, first ray $1\frac{3}{4}$, tenth ray $1\frac{1}{10}$, last ray joined by membrane with caudal peduncle; A. II, 22, tenth ray $1\frac{1}{4}$, lower fin edge deeply notched behind tip of each ray; least depth of caudal peduncle $1\frac{1}{4}$; pectoral 1, rays 11; ventral rays 2, fin $1\frac{1}{2}$ in head; caudal 4 in rest of fish, hind edge rounded with oblique slant backward.

Color when fresh in alcohol pale drab, becoming whitish below, with livid tinge on belly. Ten transverse blackish brown bands, first 2 narrowest and on head, and others on body all give off 2 prongs on lower half of body, the upper portion of each, however, giving off pair of dark prongs on bases of dorsals. On body pale intervals with grayish bar in each. On tail first 2 brown blotches each with median blue black spot. Upper part of head in anterior half with 14 golden spots, mostly between eyes (see figure 44). Whole front of head, including preorbital, dotted with small



Figs. 41a-42.—*Salarias lacunicola* new species.
 Figs. 43-44.—*Salarias aureo-puncticeps* new species.
 Fig. 45.—*Salarias biorni* new species.

golden or pearly spots. Small black spot, less than pupil on postocular. Front of lower lip black, broad diffuse bar across connects hind end of each maxillary, third bar down over middle of gill cover and fourth blotch below opercle. Also transverse black bar before bases of ventrals. Transverse black vertical bar before lower base of pectoral. Along lower half of tail many pearly to golden longitudinal bars, besides numerous dots and small spots. First dorsal drab, with broad upper black border. Second dorsal drab, with contrasted white upper border. Caudal gray brown, lower border blackish. Anal drab gray, lower border black. Pectoral grayish, crossed by 3 or 4 rows of small golden to olive dots on fin rays. Ventral grayish terminally.

A.N.S.P., no. 72050. Aguni Shima, Riu Kiu Islands. July 27. Length 95 mm. Type.

Only the type secured. Apparently related to *Salarias coronatus* Günther, but differing markedly in coloration and the rounded caudal fin. Both soft dorsal and anal with black borders and second dorsal with a white border.

(*aureus* golden + *punctus* speckled or dotted + *ceps* head.)

Salarias biorni new species

Figure 45.

Depth $4\frac{1}{2}$; head $4\frac{1}{2}$, width $1\frac{1}{2}$. Snout (in profile) 3 in head, front profile little inclined forward from vertical; eye $3\frac{1}{2}$, $1\frac{1}{2}$ in snout, greatly exceeds interorbital, low, inferior, with lower jaw included; maxillary not quite reaching back of hind eye edge, length $3\frac{3}{4}$ in head; lips fleshy, edges entire; teeth fine, closely set, numerous, flexible; apparently no canines; bony interorbital width about $\frac{1}{2}$ of eye diameter, concave. Gill opening with broad free membrane over wide isthmus.

Skin smooth. A palmate supraorbital flap, edges little crenulate, little shorter than eye. Front nostril with short simple flap. Broad cutaneous median keel behind eye over most of predorsal space. Lateral line elevated as short arch above depressed pectoral.

D. XII, 18, fin deeply notched with notch below middle of fin depth, first spine $2\frac{1}{4}$ in total length of head, fifth ray $1\frac{1}{2}$, last ray united with caudal peduncle by membrane; A. II, 21, eighth ray 2 in head, lower edge of fin with membrane deeply notched behind tip of each ray; least depth of caudal peduncle 2; caudal $1\frac{1}{4}$, hind edge convex; pectoral slightly exceeds head, rays 14; ventral rays 2, fin $1\frac{1}{2}$ in head.

Color when fresh in alcohol gray brown, with broad dark brown cross blotch on head above and 6 more obscurely on back and side of body. Numerous close set black dots on cheek, opercles, prepectoral and costal region. Lips dark blackish brown, also edge of gill fold narrowly over isthmus. Belly livid slate gray color. Iris gray. Dorsals brownish, dark body blotches reflected on fins basally. Second dorsal and anal with many pearly gray parallel lines, arched up and back, crossing rays. Anal pale gray, like under surface of tail, with broad dark gray submarginal band and tips of rays white. Caudal gray, with large round pale spot at base of each lobe and median dark to blackish caudal spot basally little less than eye. Pectoral gray, with some small dark spots basally, besides transverse brown basal bar and another down over prepectoral space. Ventral pale or light gray.

A.N.S.P., no. 72051. Aguni Shima, Riu Kiu Islands. July 27. Length 48 mm. Type.

Only the type obtained. Apparently distinct in its coloration and combination of structural characters.

(For Major Carl Biorn, of Minneapolis, Minnesota, who greatly assisted in making the present collection of fishes possible.)

***Salarias atrimarginatus* new species**

Figure 46.

Depth $4\frac{1}{2}$; head $3\frac{2}{5}$, width $1\frac{1}{2}$. Snout (in profile) 3 in head as measured from snout tip, front profile subvertical or little convex forward; eye $3\frac{1}{2}$, $1\frac{1}{2}$ in snout, greatly exceeds interorbital; mouth subhorizontal or slightly inclined forward, inferior, closed jaws with lower little included; maxillary extends back opposite hind eye edge, length $3\frac{1}{2}$ in head; lips smooth, entire; teeth very fine, slender, close set, flexible; no canines; interorbital narrow, concave, bony width 3 in eye. Gill opening with membranes forming broad free fold over broad isthmus.

Skin smooth. Small, simple supraoccipital tentacle, little shorter than eye. Front nostril with short simple cutaneous flap. Lateral line arched over depressed pectoral, dropping midway along front of tail it becomes disconnected and ends near middle of tail.

D. XIII, 20, 1, notch deep or down to lowest third of first dorsal ray, first spine $2\frac{1}{2}$ in total length of head, fifth ray $1\frac{1}{2}$; A. II, 20, 1, tenth ray $1\frac{1}{2}$, lower fin edge deeply notched after tip of each ray; least depth of caudal peduncle $2\frac{1}{2}$; caudal $1\frac{1}{5}$, hind edge convex; pectoral 14, fin $1\frac{1}{2}$ in total length of head; ventral $1\frac{1}{2}$, rays 2.

Color when fresh in alcohol dark olivaceous brown. Ground color of back above level with upper arch of lateral line with slightly darker fine reticulations in paler intervals between dark transverse bands, also in same intervals below each with similar colored narrow brown band or line parallel with dark transverse bands. Last named as one connecting hind part of interorbital and continued below eye as dark bar into upper lip; second as diffuse and little defined at occiput to opercle, remaining transverse dark brown bands all well defined and contrasted, broad, first (third) from front of spinous dorsal, second (fourth) twice as broad or double above lateral line and giving off pair below, extends from middle and postero-medially from spinous dorsal; third (fifth) from the interdorsal notch; remaining 3 bands from second dorsal, with last half width of others; all these bands extend well upon dorsals, though none reach the anal. Diffuse dark to blackish brown postocular bar, little inclined. Sides of head and opercle with obscure fine whitish or pearly reticulations, with several diffuse pearly spots on opercle. Lips dark blackish brown. Diffuse transverse dark bar across chin. Transverse dark brown band along edge of gill opening well towards each pectoral base, before ventral bases. Iris dark gray brown, with 5 obscure darker blotches. Dorsals dark blackish brown terminally and rays marked with small whitish spots, with oblique pale streaks more or less connecting them. Caudal with 4 equidistant white and slightly radiating streaks, dark brown separating them and terminally on fin the prevailing color. Anal blackish brown, paler subbasally and diffuse whitish spots on each membrane basally; for whole extent of fin median row of pearly spots, one spot on each membrane; tip of each anal ray white. Pectoral

olive brown, base and prepectoral region gray brown with several whitish spots and 2 short whitish lines equidistant and horizontal on fin base. Ventral whitish basally, dark brown terminally. Several pale or light gray spots in several of pale intervals between dark transverse bands on trunk.

A.N.S.P., no. 72052. Aguni Shima, Riu Kiu Islands. July 27. Length 64 mm. Type.

Only the type obtained. Apparently most closely related to *Salarias muscarus* Snyder.¹⁷ That species seems to differ in coloration, showing small or minute white dots on top of head, opercle and upper part of trunk, scattered small black spots on body, pale colored spinous dorsal with black spots, anal largely uniform and the caudal with 2 basal black spots. The last dorsal ray is connected with the caudal peduncle by a membrane and does not reach the caudal fin. The type was 50 mm. long.

(*ater* black + *marginatus* edged; with reference to the fins.)

***Petroscirtes grammistes* (Valenciennes)**

Two, 16 to 33 mm., July 27; three, 15 to 25 mm., July 29. Differs from Mintern's lithograph figure, published by Günther as *Petroscirtes anema* in 1877, in its greatly narrowed whitish longitudinal bands, these shown by Mintern as wide as the dark bands. That figure was said to have been made from an Amboina specimen 64 mm. long.

As portrayed by the figure, *Aspidontus trossulus* Snyder¹⁸ differs also in having broader light longitudinal bands, besides reticulated dorsals and spotted anal fins.

***Petroscirtes herlihyi* new species**

Figure 47.

Depth $3\frac{1}{2}$ to $3\frac{3}{4}$; head $3\frac{1}{2}$ to $3\frac{3}{4}$; width $1\frac{1}{2}$ to $1\frac{3}{4}$. Snout (in profile) $3\frac{1}{2}$ to $4\frac{1}{2}$ in head, front profile oblique, tip level with lower edge of eye; eye $2\frac{1}{2}$ to $2\frac{3}{4}$, greatly exceeds snout, subequal with interorbital; mouth small, cleft extends back little behind front edge of eye; lips entire, smooth; lower jaw with pair of large, long, recurved canines, widely set and pair of small upper canines and when jaws close outside of large lower pair; interorbital $2\frac{1}{2}$ to $2\frac{3}{4}$ in head, broadly convex. Gill opening lateral, length about 2 in head.

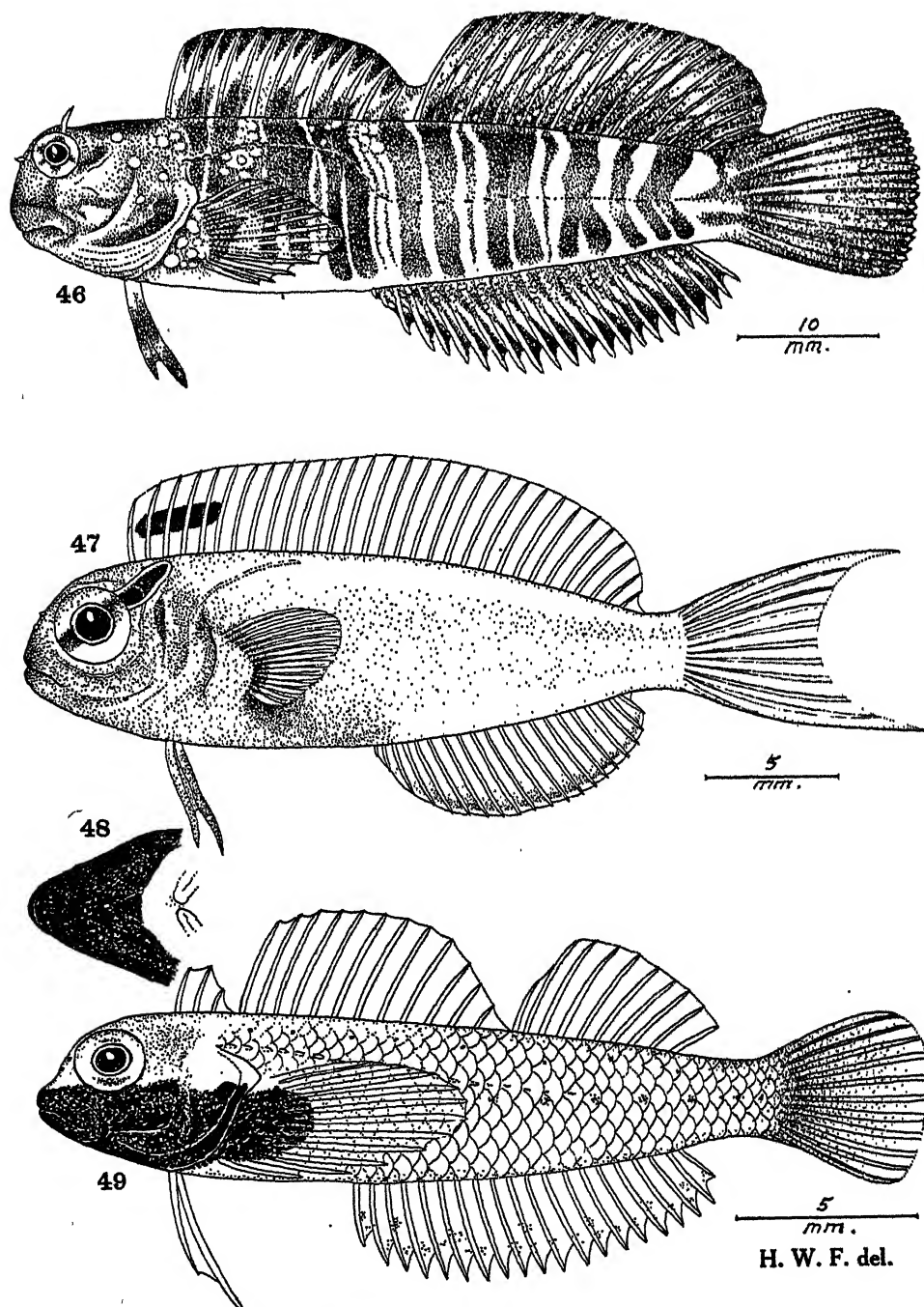
Skin smooth. No tentacles or flaps. Lateral line arches upward above depressed pectoral, but not extended so far posteriorly as tip of that fin.

D. X, 20, continuous, first spine $1\frac{1}{2}$ to $2\frac{1}{2}$ in head, first ray 2; A. II, 18, eighth ray 2 to $2\frac{1}{2}$; least depth of caudal peduncle $2\frac{3}{4}$ to $2\frac{1}{2}$; caudal $2\frac{1}{2}$ in rest of fish, deeply forked, with upper and lower rays forming exserted point above and below; pectoral rays 15, fin $1\frac{1}{2}$ to $1\frac{3}{4}$ in head; ventral $1\frac{1}{2}$ to 2, rays 2.

Color when fresh in alcohol with head and trunk gray to mauve, tail with inclusion of dorsal and caudal fins bright golden yellow. Iris dark gray, with oblique darker band up towards front of dorsal and edged with a pearly blue line. On dorsal medianly, on first 4 membranes, large black blotch. Anal and paired fins grayish.

¹⁷ Proc. U. S. Nat. Mus., vol. 35, 1909, p. 139; vol. 42, 1912, p. 519, pl. 70, fig. 1 (type locality, Naha, Okinawa, Riu Kiu Islands).

¹⁸ Proc. U. S. Nat. Mus., vol. 25, 1902, p. 455, fig. 7 (type locality, Misaki, Japan).

Fig. 46.—*Salaria atrimarginatus* new species.Fig. 47.—*Petroscirtes herlihyi* new species.Figs. 48-49.—*Enneapterygius personatus* new species.

A.N.S.P., no. 72053. Aguni Shima, Riu Kiu Islands. August 2. Length 36 mm. Type.

A.N.S.P., no. 72054. Same data. Length 33 mm. Paratype. Nos. 72055 and 72056. Same locality. July 29. Both 25 mm. Paratypes.

Differs from *Petrosciartes atrodorsalis* Günther, as compared with the colored figure published by Jordan and Seale in 1906, in the different coloration, as most of the body, together with the dorsal fins golden yellow and no black blotch on snout. The original lithographic figure by Mintern and published by Günther in 1877 is bicolored, having the dorsals broadly black basally their entire length and otherwise without markings or contrast.

(For Lieutenant Colonel William J. Herlihy.)

CLINIDAE

Enneapterygius pardochir Jordan and Seale

Three, 20 to 33 mm., July 27, in pools. Color when fresh in alcohol brilliant red, with darker markings. Body sprinkled all over with minute blackish dots. Vertical fins all more or less dusky. Pectoral reddish, with 3 dark to blackish transverse bars.

Ten, 15 to 23 mm., July 29. Three dark and swarthy, with fins more or less blackish and edges red.

Enneapterygius personatus new species Figures 48 (head below) and 49.

Depth $4\frac{1}{2}$ to $4\frac{2}{3}$; head $3\frac{1}{2}$ to $3\frac{2}{3}$, width $1\frac{1}{2}$ to $1\frac{1}{2}$. Snout (in profile) 4 to $4\frac{1}{2}$ in head, its front edge oblique and slightly concave in profile, with tip forming slightly below level of lower eye edge; eye 3 to $3\frac{1}{2}$ in head, greater than snout or interorbital; mouth little inclined from horizontal, terminal, closed jaws even; maxillary reaches back opposite front edge of pupil; length 3 to $3\frac{1}{10}$ in head; teeth uniserial in jaws, anteriorly about 5 or 6 in each enlarged, recurved; also above an inner anterior elongated patch of small teeth similar to those in sides of jaws and 6 in median longitudinal count; interorbital width $2\frac{1}{2}$ to $2\frac{2}{3}$ in eye, concave. Gill opening extends forward opposite hind edge of eye.

Scales 32? in lateral line, of which first 18 to 20 tubular and last scale on caudal base; 4 above to base of third dorsal fin, 5 below to anal base. Head, predorsal, trunk along bases of first and second dorsal, chest, breast and belly naked.

D. III—XII, X, second spine of first fin 4 in head, fifth spine of second fin 2, third spine of third fin 2; A. 20, seventh ray $2\frac{1}{2}$; least depth of caudal peduncle 3; caudal $1\frac{1}{2}$, hind edge convex; pectoral $1\frac{1}{10}$, rays 11; ventral $1\frac{1}{2}$, rays 2.

Color when fresh in alcohol bright red. Whole lower half of head, prepectoral region into gill opening and large blotch over nearly basal third of pectoral blackish brown; under a lens this seen to be made up of innumerable small black ocelli ringed with brown or dark brown, so that whole area on head and basal pectoral region greatly contrasted with general red color. Iris carmine. Fins all pinkish. Caudal with large median grayish area. Also series of 6 or 7 small blackish spots are made up as a cluster of as many very minute slightly pale edged ocelli along back above lateral line.

Close along and below lateral line remaining nontubular scales on the tail, a series of inconspicuous dark spots, which under a lens are each seen to be made up of several dark dots. Dorsals with spines each marked with several or 3 or 4 brown or darker gray spots, more or less obscured in appearance. Likewise anal subterminally, though only 6 rays appear more contrasted or with markings segregated as larger markings.

A.N.S.P., no. 72057. Aguni Shima, Riu Kiu Islands. July 27. Length 25 mm. Type.

A.N.S.P., nos. 72058 and 72059. Same data. Length 14 to 26 mm. Paratypes.

Distinguished by its contrasted coloration, the large blackish area on the lower surface of the head also extending on the pectoral base but below not on the chest, the gray caudal fin and structural details.

(*personatus* masked, with reference to the black coloration of the head.)

Enneapterygius fuscipectoris new species Figures 50 and 51 (head below).

Depth $4\frac{1}{2}$ to 5; head $3\frac{1}{2}$ to $3\frac{3}{4}$, width $1\frac{1}{2}$ to $1\frac{1}{2}$. Snout (in profile) 3 to $3\frac{1}{2}$ in head, upper profile well inclined, slightly concave; eye 3 to $3\frac{1}{2}$, greater than snout or interorbital; mouth low, nearly horizontal, closed jaws subequal; maxillary reaches little beyond front of eye, length 3 to $3\frac{1}{2}$ in head; teeth small, simple, conic, in narrow irregularly biserial bands in front of each jaw, where 4 or 5 are little enlarged and recurved, uniserial and small along sides of jaws; interorbital concave, bony width less than half of eye diameter. Gill opening extends forward nearly opposite hind edge of eye, forming free fold over broad isthmus.

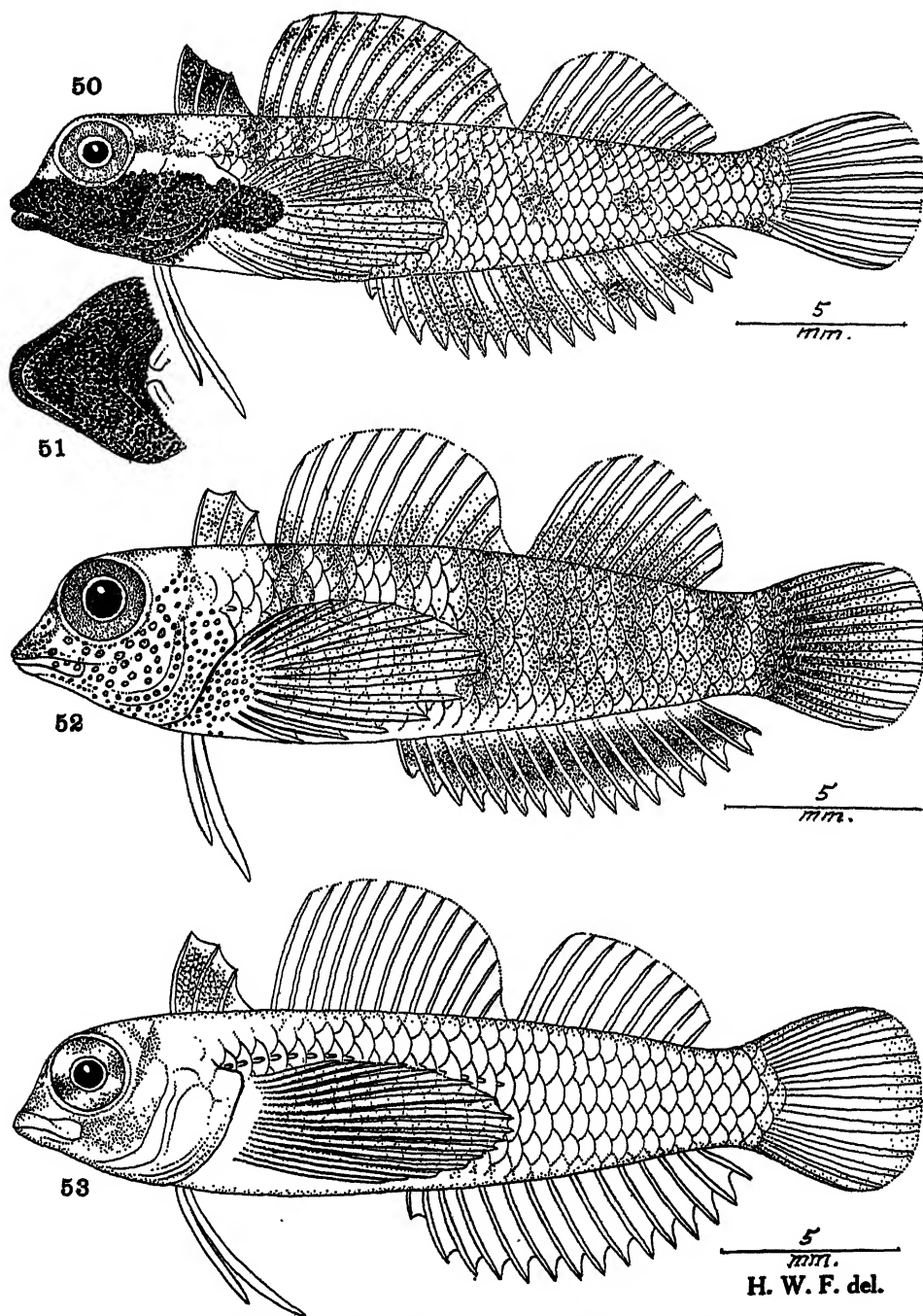
Scales $37 + 2$ in lateral line, of which first 19 tubular; 9 or 10 transversely between bases of third dorsal and anal fin. Head, predorsal, space along bases of first and second dorsals, chest and breast naked, also along anal base anteriorly.

D. III—XIII—XII, first spine of first dorsal $3\frac{1}{2}$ to $3\frac{1}{2}$ in head, fourth spine of second dorsal 2, third spine of third dorsal 2 to $2\frac{1}{2}$; A. I, 18, fifth spine $2\frac{1}{2}$, lower edge of fin deeply notched behind tip of each ray; least depth of caudal peduncle 3 to $3\frac{1}{2}$; caudal $1\frac{1}{2}$ to $1\frac{1}{2}$, convex behind; pectoral subequal with head, rays 15; ventral rays 2, fin $1\frac{1}{2}$ to $1\frac{1}{2}$ in head.

Color when fresh in alcohol bright red generally. Whole lower part of head below eye, inclusive of breast to close before ventral fin bases dark gray, which under a lens is seen to be composed of small close set blue black spots. This dark area extends also out on basal part of pectoral, where it is more or less surrounded by a pale pink area. Upper part of head behind eyes brown, with darker or grayish. Upper front of head before eyes somewhat pale pink. A pink bar from lower part of eye back to upper part of gill opening. On body 7 transverse darker bars down to lateral line, but below it on tail with dark blotches, each little behind course of upper mark. Fins pale, all more or less with gray, best understood with reference to the accompanying illustration.

A.N.S.P., no. 72060. Aguni Shima, Riu Kiu Islands. July 27. Length 27 mm. Type.

A.N.S.P., no. 72061. Same data as type. Length 25 mm. Paratype.



Figs. 50-51.—*Enneapterygius fuscipectoris* new species.

Fig. 52.—*Enneapterygius fuligicauda* new species.

Fig. 53.—*Enneapterygius macrobrachium* new species.

H. W. F. del.

A species greatly resembling *Enneapterygius personatus* but differing chiefly in details of coloration, especially the black on the lower surface of the head extended backward on the chest.

(*fuscus* swarthy + *pectoris* chest.)

***Enneapterygius fuligicauda* new species**

Figure 52.

Depth $3\frac{1}{2}$ to 4; head $3\frac{1}{2}$ to $3\frac{1}{4}$, width $1\frac{3}{4}$. Snout (in profile) 3 to $3\frac{1}{2}$ in head, with inclined concave upper profile; eye $2\frac{3}{4}$ to 3, greater than snout or interorbital; mouth nearly horizontal, with closed jaws subequal in front; maxillary reaches back nearly opposite front edge of pupil, length $2\frac{1}{4}$ to 3 in head; teeth largely uniserial in jaws, anteriorly 4 or 5 slightly enlarged in each, and lower inner teeth greatly smaller, imperfect second villiform row; palate toothless; interorbital narrow bony frenum $\frac{1}{4}$ of eye diameter. Gill opening extends forward not quite opposite hind edge of eye, forming free fold over broad isthmus.

Scales $30 + 2$ in lateral line of which first 13 to 17 tubular; 3 scales above lateral line to base of third dorsal fin, 4 below to anal base. Head, predorsal and region around base of first dorsal, chest, breast, belly and space along front of anal basally, scaleless.

D. III—XI to XIII—X or XI, first spine $2\frac{1}{2}$ to 4 in head, fourth spine of second dorsal $1\frac{1}{2}$ to 2, fourth spine of third dorsal $1\frac{1}{2}$ to 2; A. I, 16, median fin with height $2\frac{1}{10}$ to $2\frac{1}{2}$, lower edge of fin notched behind tip of each ray; least depth of caudal peduncle $2\frac{1}{2}$ to 3; caudal $1\frac{1}{4}$ to $1\frac{1}{2}$, convex behind; pectoral rays 12, fin $2\frac{1}{4}$ to 3 in fish without caudal; ventral $1\frac{1}{2}$ in head, rays 2.

Color when fresh in alcohol, body tinged with red and pink. Lower half of head sprinkled with innumerable small crowded black dots or spots, faint or grayish on under surfaces of head, though extend back to bases of ventrals and a few even reach back of or behind the bases of the ventrals. Head behind eyes or on occiput, bright red. Iris gray. On body 3 dark brown transverse bands extend from second dorsal, and 2 less distinct from base of third dorsal, also one on caudal peduncle. Whole tail behind fourth transverse dark band, inclusive of caudal sprinkled with fine dark gray dots or points, producing a swarthy or sooty appearance. Anal with broad dark median band-like area its whole extent, leaving ends of rays pale. Dorsals without marks, except basally dark gray, especially where transverse dark bands are reflected. Paired fins pale and immaculate.

A.N.S.P., no. 72062. Aguni Shima, Riu Kiu Islands. July 27. Length 33 mm. Type.

A.N.S.P., nos. 72063 and 72064. Same data. Length both 19 mm. Paratypes. Color of tail and caudal fin pale or with only faint traces of transverse dark bands. On trunk they are more distinct and the whole lower sides and under surface of the head pale and immaculate. They have, however, some brown specks on snout above, on opercle and on base of pectoral. Band from middle of predorsal also distinct down on upper side of head to opercular cluster of dark specks. Eyes dark carmine and occiput red.

Apparently related to *Enneapterygius punctulatus* Herre¹⁹ in the large scales, but differs in details of coloration and the large pectoral.

(*fuligo* soot + *cauda* tail.)

***Enneapterygius macrobrachium* new species**

Figure 53.

Depth 4; head $3\frac{1}{10}$, width $1\frac{1}{2}$. Snout (in profile) 5 in head, with well inclined upper profiles little concave; eye 3, greatly exceeds snout or interorbital; mouth nearly horizontal, closed jaws even in front; maxillary reaches opposite pupil, length $3\frac{1}{2}$ in head; teeth very small, uniserial, simple, conic, curved and only 3 or 4 anterior ones in each jaw slightly enlarged; palate toothless; interorbital narrow, concave, bony width $\frac{1}{2}$ of eye diameter. Gill opening extends well forward but not quite opposite hind edge of eye, membrane forming free fold over broad isthmus.

Scales 30 + 2 in lateral line, of which first 17 tubular; 2 scales above to base of third dorsal and 3 below to anal base. Head, predorsal, space about base of first dorsal, chest, breast and prepectoral, also belly scaleless.

D. III—XIII—IX, first spine in first dorsal $2\frac{2}{5}$ in head, fourth spine in second dorsal $1\frac{1}{2}$, second spine in third dorsal $2\frac{1}{2}$; A. I, 14, fin height $2\frac{1}{10}$, lower edge of fin notched behind tip of each spine; least depth of caudal peduncle $2\frac{1}{2}$; caudal $1\frac{1}{2}$, convex behind; ventral $1\frac{1}{2}$, rays 2; pectoral reaches half way to caudal or $2\frac{2}{5}$ in fish without caudal and rays 15.

Color when fresh in alcohol largely uniform red, fins pink. Iris red. Several obscure brown patches in interorbital and on cranium.

A.N.S.P., no. 72066. Aguni Shima, Riu Kiu Islands. July 27. Length 24 mm. Type.

Only the type obtained. Distinguished chiefly by its uniform coloration, large scales and long pectoral.

(*μακρὸς* long + *βραχίον* arm or pectoral.)

***Enneapterygius quadrimaculatus* new species**

Figure 54.

Depth $4\frac{1}{2}$; head $3\frac{1}{2}$, width $1\frac{1}{2}$. Snout (in profile) 4 in head, front profile steeply inclined and slightly convex; eye 3, greatly exceeds snout or interorbital; mouth nearly horizontal, closed jaws even in front; maxillary reaches nearly opposite center of eye, length $2\frac{3}{4}$ in head; teeth apparently uniserial in jaws, conic, simple, very small, also less prominent above, but 6 anterior in mandible conspicuous, recurved and little enlarged; interorbital narrow, concave, its bony width equals $\frac{2}{3}$ of eye. Gill opening extends forward nearly opposite hind eye edge, forms broad free fold over wide isthmus.

Scales little developed and apparently only on trunk and tail. Lateral line incomplete, tubes anteriorly only on 17 rather large scales and last not quite reaching to third dorsal fin.

D. III—XIII—IX, first spine in first dorsal $3\frac{1}{2}$ in head, first spine of second dorsal $1\frac{1}{2}$, second spine of third dorsal $1\frac{1}{2}$; A. I, 18, fin height $2\frac{1}{2}$, lower edge of fin notched behind tip of each ray; least depth of caudal peduncle 3; caudal $1\frac{1}{2}$, convex behind; ventral $1\frac{1}{10}$, rays 2; pectoral $3\frac{1}{2}$ in fish without caudal, rays 13, edges of membranes of lower 7 simple rays notched.

¹⁹ Field Mus. Publ., vol. 21, Zool. Ser. no. 353, 1936, p. 397, fig. 37 (New Hebrides).

Color when fresh in alcohol reddish, pale or pink below and on fins. Iris pinkish gray. Small dark dots on head form at snout tip and as narrow dark line to eye, on upper postocular part of head, row along preopercle edge, blotch on opercle and also blotch on prepectoral region widens and includes lower median pectoral rays. On trunk 8 dark transverse ill defined bands, as 4 from second dorsal, 2 from third dorsal and 2 on caudal peduncle. All dorsal spines with some dark dots, at least basally, and on second and third dorsals dark basal dots. Caudal grayish. Anal with 4 median dark blotches made up of gray black dots.

A.N.S.P., no. 72066. Aguni Shima, Riu Kiu Islands. August 2. Length 24 mm. Type.

Only the type obtained. Apparently a finely scaled species, or at least with about 6 small scales above the lateral line near middle of body, and the distinctive coloration. It is suggestive somewhat of *Enneapterygius hudsoni* Jordan and Seale²⁰ but differs greatly in the coloration of the anal fin.

(*quadrus* four + *maculatus* spotted; with reference to the four large dark anal blotches.)

Enneapterygius inclinatus new species

Figure 55.

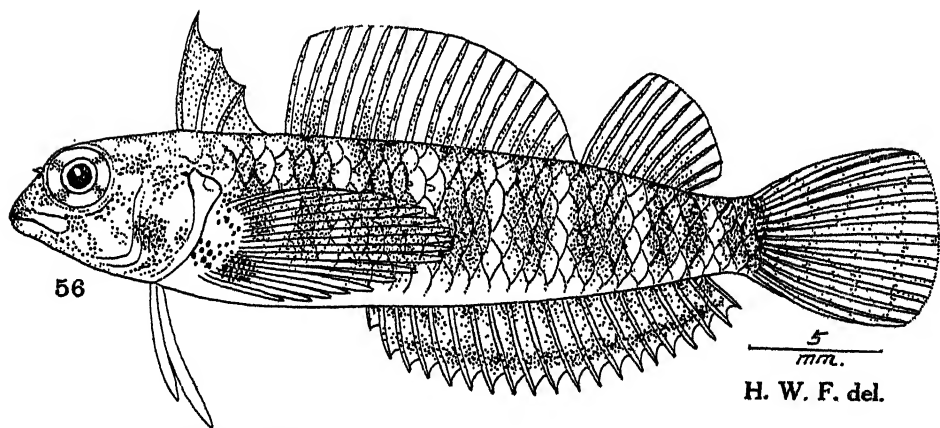
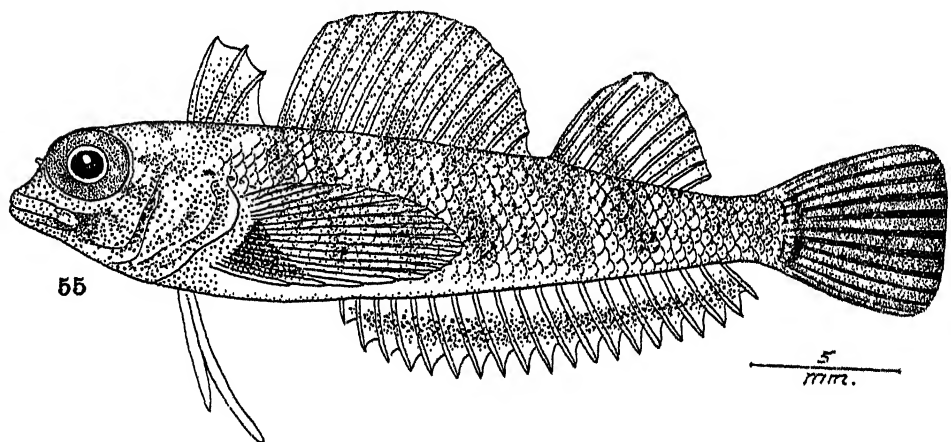
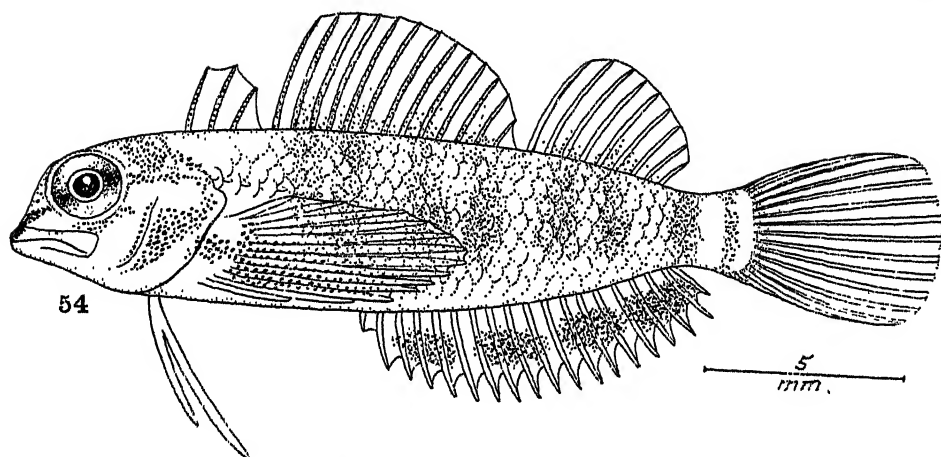
Depth $4\frac{1}{2}$; head $3\frac{1}{2}$, width $1\frac{1}{2}$. Snout (in profile) 5 in head, profile oblique and little concave; eye $2\frac{1}{2}$, greater than snout or interorbital; mouth little inclined from horizontal, closed jaws even in front; maxillary reaches opposite front edge of pupil, length 3 in head; teeth in jaws very small, simple, conic, pointed, uniform, apparently none of anterior enlarged, in 3 or 4 irregular series forming rather broad bands; no teeth on palate; interorbital narrow, concave, width of bony frenum $\frac{1}{2}$ of eye. Gill opening extends forward about opposite hind edge of eye, forms broad free fold over broad isthmus.

Scales 40 in lateral line to caudal base, of which first 22 tubular; 7 above to third dorsal origin, 6 or 7 below to hind basal part of anal. Head, pre-dorsal, prepectoral, region about base of first dorsal and most of second dorsal, chest, belly and anterior basal anal regions, naked.

D. III—XIV—X, first spine of first dorsal $2\frac{1}{2}$ in head, fifth spine of second dorsal $1\frac{1}{2}$, second spine of third dorsal $1\frac{2}{10}$; A. I, 19, fin height $2\frac{1}{2}$, lower edge of fin deeply notched behind tip of each ray; least depth of caudal peduncle $3\frac{1}{2}$; caudal $1\frac{1}{2}$, convex behind; pectoral 1, rays 16; ventral rays 2, fin $1\frac{1}{2}$ in head.

Color when fresh in alcohol pale brownish. Head largely sprinkled with dark dots, darkest on cheek and opercle, pale or gray on head above and below. Head with several dark blotches along suborbitals on cheek. Iris dark gray. On body 8 transverse dark brown bands, more or less inclined down and back, darkest below lateral line and median axis of body. These bands also reflected on second and third dorsals basally and with dark blotches opposite their lower terminations as reflections on anal fin medially. Fins more or less grayish, except as noted, and dark blotches

²⁰ Bull. Bur. Fisher. (U. S.), vol. 25, 1905 (1906), p. 419, fig. 101 (type locality, Apia, Samoa).



H. W. F. del.

Fig. 54.—*Enneapterygius quadrimaculatus* new species.
Fig. 55.—*Enneapterygius inclinatus* new species.
Fig. 56.—*Enneapterygius vexillarius* new species.

on anal appearing more or less connected medially to form somewhat as gray band. Pectoral with dark brown basal blotch on lower medial rays.

A.N.S.P., no. 72067. Aguni Shima, Riu Kiu Islands. July 27. Length 32 mm. Type.

Only the type obtained. Appears to be related to the East Indian *Tripterygion trigloides* Bleeker 1858 and according to Weber's figure in 1913 it would differ greatly in color pattern. Further the scale count of 47 to 50 in a longitudinal series is given by Herre²¹ for Philippine specimens.

(*inclinatus* inclined, with reference to the dark transverse bands sloping backwards.)

***Enneapterygius vexillarius* new species**

Figure 56.

Depth $4\frac{1}{2}$; head $3\frac{3}{4}$, width $1\frac{1}{2}$. Snout (in profile) $3\frac{1}{2}$ in head, upper front profile oblique and nearly straight; eye $3\frac{1}{10}$, greatly exceeds snout or interorbital; mouth nearly horizontal, closed jaws even in front; maxillary reaches back opposite front pupil edge, length $3\frac{1}{2}$ in head; teeth in jaws largely uniserial and several of anterior in each little enlarged, recurved; arc of small teeth as irregularly across palate posteriorly; interorbital narrow bony frenum, concave, its width $\frac{1}{4}$ of eye; nostril with very minute cutaneous flap. Gill opening extends forward opposite hind margin of eye and forms free fold over broad isthmus.

Scales 30 in lateral line, of which first 14 tubular; 2 rows above to base of second dorsal posteriorly, 3 rows below to base of anal posteriorly. Head, predorsal, chest, breast, belly and regions along bases of first and second dorsals and front part of anal, scaleless. I find no suborbital filament.

D. III—XVI—X, first spine of first dorsal $1\frac{1}{2}$ in head, sixth spine of second dorsal $1\frac{1}{2}$, second spine of third dorsal 2; A. I, 19, fin height $2\frac{1}{2}$, lower edge of fin notched behind tip of each ray; least depth of caudal peduncle 3; caudal $1\frac{1}{10}$, convex behind; pectoral 1, rays 1, 15; ventral rays 2, fin $1\frac{1}{2}$ in head.

Color when fresh in alcohol red, with 8 transverse darker cross bands and more or less well reflected on dorsal fins, but reaching below to base of anal fin. Narrow dark brown bar from tip of snout to eye, which it crosses and extends less vividly on postocular. Dark brown spot on cheek below eye and another along cheek above. Two dark blotches on gill covers, with lower darker. Two dark brown blotches on pectoral base, lower more distinct. Pectoral reddish, with 3 indistinct dull brownish cross bars. Aside from dark invading cross bars from body each dorsal spine with 3 or 4 dark gray spots. Anal reddish, with 10 transverse dark bars, most distinct along base of fin. Caudal red, with 5 irregular transverse gray bars. Ventral uniform red. Iris crimson.

A.N.S.P., no. 72068. Aguni Shima, Riu Kiu Islands. July 27. Length 39 mm. Type.

Only the type secured. Closely related to *Tripterygion etheostoma* Jordan and Snyder,²² but differs in the dark transverse bands invading the

²¹ Philippine Journ. Sci., vol. 70, no. 4, Dec 1939, p. 318.

²² Proc. U. S. Nat. Mus., vol. 25, 1902, p. 444, fig. 1 (type, locality, Misaki; Wakonoura; Atani, Japan).

dorsal fins, coloration of the fins and head, the shorter lateral line and the larger scales.

(*veixillarius*, with reference to a banner, suggested by the longer or larger first dorsal fin.)

BROTULIDAE

CALCARBROTULA new genus

TYPE.—*Calcarbrotula erythraea* new species.

Body elongately ellipsoid, moderately compressed, with an elongated tapering tail. Head large, robust, cavernous. Snout obtuse, convex. Eye very small, well advanced in head or to about first third in maxillary. Mouth moderately large, terminal, little inclined. Teeth very small, minute, with several of lower laterals enlarged. Occiput forms at first $\frac{3}{4}$ in head. Gill opening large, deeply cleft forward in head. Gill rakers short, few, robust. Scales uniformly small, extend well forward over postocular region of head. Bases of vertical fins scaly. Lateral line not distinct. Dorsal long, but separated from caudal, leaving a short, narrow though distinct caudal peduncle. Anal similar to dorsal, but shorter. Caudal small, narrow, pointed. Pectoral median in body depth, less than head. Ventral a single small slender filamentous ray. Color bright vermilion.

Apparently related to *Myoxocephalus* Steindachner and Döderlein, but differs in the free caudal fin, the prominent spur on the lower maxillary edge, large gill rakers, smooth skin on top of head, scaly predorsal and head, and apparently absence of the lateral line.

(*calcar* spur + *Brotula*; with reference to the maxillary.)

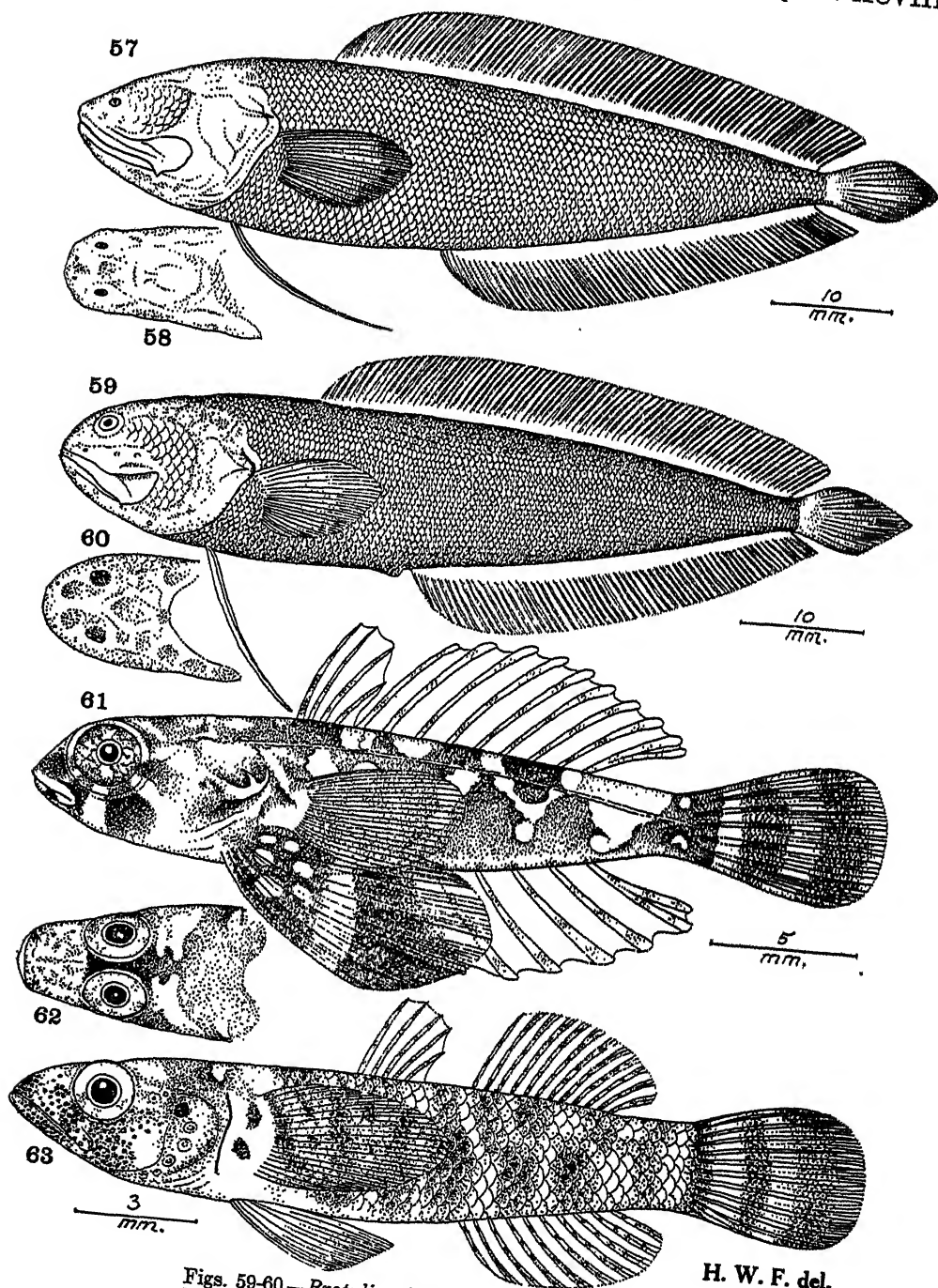
Calcarbrotula erythraea new species

Figures 57 and 58 (head above).

Depth $4\frac{1}{2}$; head $3\frac{3}{4}$, width $2\frac{1}{4}$. Snout 6 in head, tip forms in front slightly below level of lower eye edge; eye $2\frac{1}{2}$ in snout, 4 in interorbital; mouth slightly inclined from horizontal, closed jaws with lower slightly included; maxillary with upper hind edge exposed, reaches beyond middle in head, or its length $1\frac{3}{4}$ in head, long spur or spine on lower edge subterminally prominent; teeth in bands, villiform in jaws, on vomer and palatines; along each side of lower jaw row of 3 large prominent teeth; tongue fleshy point; interorbital width $3\frac{1}{2}$ in head, convex, cavernous; opercle with rather long, strong spine directed back, and only its tip free. Gill opening extends forward to first third in head, membrane forming free fold over narrow isthmus. Gill rakers 0 + 4 developed, though 4 other rudimentary tubercles both above and below, longest not longer than short gill filaments, which are long as eye.

Scales cycloid, small, about 75 in axial lateral series; 25 transversely from above anal fin origin to dorsal base; 15 predorsal forward to occiput. Patch of rather distinct scales behind eye and above maxillary. Fins apparently scaleless, though along bases of most a more or less soft adipose like band. Top of head with smooth pliable skin.

D. 73, origin behind pectoral base, fin height $2\frac{3}{4}$ in head; A. 63, fin origin little nearer snout tip than caudal base, fin height 3 in head; least depth of caudal peduncle $6\frac{1}{2}$; pectoral $1\frac{1}{2}$, rays 18; ventral 1.



Figs. 59-60.—*Brotulina fusca* new species.
 Fig. 61.—*Synchiropus rhodonotus* new species.
 Figs. 57-58.—*Calcarbrotula erythraea* new species.
 Figs. 62-63.—*Rukukia poecila* new species.

H. W. F. del.

Color when fresh in alcohol brilliant orange red, less vivid on belly. End of muzzle, including mandible, brilliant orange scarlet, also under surface of head with scarlet infusion. Iris greenish gray. On tail an axial streak of deep orange, submarginal portions broadly form pale orange border, both above and below or along bases of dorsal and anal fins respectively. Vertical fins and pectoral deep orange red. Ventral pale or whitish.

A.N.S.P., no. 72069. Aguni Shima, Riu Kiu Islands. September 8. Length 73 mm. Type.

Only the type obtained.

(*ἐρυθραῖος* reddish.)

BROTULINA new genus

TYPE.—*Brotulina fusca* new species.

Upper profile of head convex forward of eye. Snout broadly obtuse, its tip forming in front well below level of eye. Eye moderate, small, opposite middle of maxillary as seen in profile. Maxillary with small, short inconspicuous lower subterminal and concealed spine or denticle. Mouth terminal. Occiput formed at first $\frac{2}{3}$ of head. Scales minute, uniformly small. Cheek and postocular well scaled. Lateral line indistinct, as arch over pectoral and down to front part of tail medially. Bases of dorsal, anal and caudal with scales, more or less imbedded or veiled in appearance. Coloration drab brown.

This genus differs in the above details from *Calcarbrotula*, besides the entirely different physiognomy of the head.

(*Brotulina*, diminutive of *Brotula*.)

Brotulina fusca new species

Figures 59 and 60 (head above).

Depth $4\frac{3}{4}$; head $3\frac{1}{4}$, width $2\frac{1}{4}$. Snout 4 in head; eye $2\frac{1}{4}$ in snout, $2\frac{1}{4}$ in interorbital; mouth oblique, closed jaws with lower slightly protruded; maxillary moderately long, reaches middle of head, hind expansion exposed, length 2 in head; teeth in villiform bands in jaws, on vomer and palatines; along each side of lower jaw row of 3 little enlarged; tongue firm fleshy point; interorbital width $2\frac{1}{4}$ in head, convex, cavernous; opercle with flat spine directed back. Gill opening extends forward not quite opposite to eye. Gill rakers 0 + 3 small, short, clavate points developed on lower arch.

Scales 115 in longitudinal lateral series; 30 transversely between dorsal and anal bases; 22 predorsal forward to occiput; about 8 in horizontal series on postocular. Row of 20 pores arched well above pectoral. Along bases of all vertical fins a more or less narrow band of veiled or imbedded scales on each.

D. 75, fin height $2\frac{1}{2}$ in head; A. 58?, fin height $2\frac{1}{2}$; least depth of caudal peduncle 6; caudal $1\frac{2}{3}$, pointed posteriorly; pectoral $1\frac{1}{4}$, rays 18; ventral 1, a single ray.

Color when fresh in alcohol largely uniform pale drab brown. Mucous areas of muzzle, opercles and under surface of head more or less drab, paler along edges of defined bony ridges and as pale ring around each of pores. Iris dark blue gray or blackish. Fins all more or less whitish, verticals with subbasal grayish band.

A.N.S.P., no. 72070. Aguni Shima, Riu Kiu Islands. August 7, in pool. Length 69 mm. Type.

Only the type obtained. Characters included in those of the genus as described above.

(*fusca* brown.)

CALLIONYMIDAE

Synchiropus rhodonotus new species

Figure 61.

Depth $4\frac{1}{2}$ to $4\frac{1}{2}$; head $2\frac{3}{4}$ to $2\frac{3}{10}$ as measured to hind tip of preopercular spine, width $1\frac{3}{4}$ to $1\frac{1}{2}$. Snout (in profile) 4 to $6\frac{3}{4}$ in head, its tip level with lower edge of eye; orbit $2\frac{1}{4}$ to 3, impinging on upper profile of head; eye diameter $3\frac{1}{4}$ to $3\frac{1}{2}$; mouth little inclined, closed jaws even in front; maxillary extends back slightly behind front eye edge, length $4\frac{1}{2}$ in head; teeth very minute, simple, in narrow irregular series in each jaw, not easily made out; interorbital narrow bony frenum, concave and about $\frac{1}{4}$ of eye diameter; preopercular spine long as eye, ends in upturned spur and with subterminal denticle on upper edge curved forward. Gill opening about half as long as eye, above end of preopercular spine and more or less concealed in lateral view.

Skin smooth. Lateral line begins at gill opening and its course rather high along side of back to median base of caudal peduncle.

D. IV—9, 1, first spine $1\frac{1}{2}$ to $2\frac{1}{10}$ in head, third ray $1\frac{1}{2}$; A. 6, 1, first ray $1\frac{3}{4}$ to 2; least depth of caudal peduncle $3\frac{1}{4}$ to $3\frac{3}{4}$; caudal 1 to $1\frac{1}{4}$, hind edge convex; pectoral 1 to $1\frac{3}{4}$, rays 20; ventral $2\frac{1}{4}$ to $2\frac{3}{4}$ in fish without caudal, rays 5.

Color when fresh in alcohol with back rose pink and under surfaces whitish. Three dark brown bands radiate from eye below, of which lowest posteriorly broadest. Snout brown. Eye marbled with gray, dark gray and pearly. Blackish brown blotch behind preopercular spine. Back crossed by 4 transverse brown bands; first at first dorsal, second and third from second dorsal and last at caudal peduncle close before caudal. Although following the above pattern of the type the bands vary slightly in outline and intensity. Most, however, show large pale brown areas along lower side of body below lateral line but not extending to the anal fin. Caudal with dark transverse bands, basal blackish and other 2 dark gray. Dorsals and anal pale or transparent with very pale spots on some of rays. Pectoral pale or whitish, with brown blotch at origin, reflected in axil, also another short brown blotch on prepectoral region. Ventral with broad blackish gray basal area, marked with 7 or 8 white spots; broad median band and end of fin white, with broad gray black subterminal cross band.

A.N.S.P., no. 72071. Aguni Shima, Riu Kiu Islands. August 2, on bottom of pools. Length 30 mm. Type.

A.N.S.P., nos. 72072 and 72074. Same data. Length 23 to 27 mm. Paratypes. No. 72075. Same locality. July 29. Length 14 mm. Paratype.

A species approaching *Synchiropus lili* Jordan and Seale,²³ differing chiefly in coloration. It also resembles *Synchiropus shoe* Okada and

²³ Bull. Bur. Fisher. (U. S.), vol. 25, 1905 (1906), p. 415, pl. 53, fig. 2 (type locality, Apia, Samoa).

Ikeda,²⁴ but in that species the coloration is far less contrasted, eye smaller, proportions different and the spinous dorsal inserted more posteriorly.

In my smaller examples the dark bars on the back are all more or less contrasted and with distinct and rather large pearly round spots. Although many minor differences as to the size, number and appearance of the pearly spots vary, the general pattern of the larger and darker markings is retained.

($\rho\delta\delta\sigma\nu$ rose + $\nu\omega\tau\sigma$ back.)

SIGANIDAE

Siganus fuscescens (Houttuyn)

Depth 2 $\frac{3}{4}$. Caudal slightly emarginate.

Color when fresh in alcohol largely dull olivaceous above, paler to grayish below. Six longitudinal dark or olive bands, variously waved or defining some darker spots or mottling. Breast and belly largely uniform. Under surface of head whitish, with 2 transverse brown blotches. No dark shoulder blotch. Spinous dorsal gray, with darker spots on spines and spinous anal similar. Rayed dorsal and anal pale or whitish, with some dark spots along bases of fins. Caudal gray, several dark spots along upper and lower fulcra. Pectoral gray white. Ventral whitish, each with 3 gray blotches. One, 44 mm. July 27.

TEUTHIDAE

Teuthis japonicus (P. J. Schmidt)

Color when fresh in alcohol dark olive to blackish. Broad yellow band along dorsal and anal bases, gradually expanded broader posteriorly. Edges of rayed vertical fins narrowly yellow. In dark outer area of soft dorsal a longitudinal orange yellow ill defined band. Caudal largely grayish, becoming orange yellow basally and broad hind border yellow. Very brilliant and broad orange red band below eye and narrowing at maxillary. Pectoral base brilliant yellow, fin otherwise gray. One, 120 mm., July 27.

A well distinguished species described as *Hepatus aliala japonicus* by Prof. Schmidt.²⁵

Teuthis triostegus (Linnaeus)

Nine, 29 to 59 mm., July 27, in pools; one, 45 mm., August 7, in pools. Of the former lot several of the smaller ones with *Acronurus* features, as the striate skin, more rounded body contour and the tail with distinct though scattered and rather sparse minute denticles.

Teuthisoughtoni Whitley

One, 128 mm., July 27. Although with malformed spinous dorsal this specimen agrees very well with the original figure, Mr. Whitley's drawing.²⁶

²⁴ Bull. Biogeogr. Soc. Japan, vol. 7, no. 7, March 1937, p. 90, figs. 4-5 (type locality, Kowan, Okinawa Honto).

²⁵ Trans. Pacific Comm. Acad. Sci. USSR., vol. 1, 1930, p. 102, pl. 6, fig. 3 (type locality, Kominato, Anami Oshima, Riu Kiu Islands).

²⁶ Records Austral. Mus., vol. 16, no. 4, March 28, 1928, pl. 16, fig. 1.

The disposition of the dark lines is in agreement, though my specimen has the vertical bands all broader, especially above and is without a dark bar or spot on the caudal peduncle.

***Teuthis lineolatus* (Valenciennes)**

Two, 63 to 132 mm., July 27. Coloration with uniform dark brown appearance. Iris bright blue. Smaller specimen with black spot in hind axil of soft dorsal.

***Teuthis lineatus* (Linnaeus)**

Color when fresh in alcohol with 7 blue black-bordered longitudinal bands, alternating with yellow bands, on back and sides. Vertical fins gray black. Pectoral pearl gray. Ventral yellowish, with dark brown border in front, also narrow blue outer edge. Two, 59 to 62 mm., July 27.

***Ctenochaetus strigosus* (Bennett)**

One, 65 mm., June 27. Color generally dark or blackish brown. On side of body very numerous, parallel and close-set obscure longitudinal narrow darker bands.

***Zebrasoma supra-alba* new species**

Figure 70.

Depth $1\frac{1}{2}$; head 3, width $2\frac{1}{4}$. Snout $1\frac{1}{2}$ in head length, tip level with pectoral origin; eye $3\frac{1}{2}$, $2\frac{3}{4}$ in snout, slightly greater than interorbital; mouth small, terminal; teeth 14 above, 16 below, compressed, edges denticulated; interorbital $3\frac{1}{2}$ in head, low, very slightly convex. Gill opening $1\frac{1}{2}$ in head.

Scales irregular, all finely asperous, rough to touch, with asperities extending well upon vertical fin rays. Depressible caudal spine $1\frac{1}{2}$ in eye.

D. V, 23, fifth spine $1\frac{1}{2}$ in head, third ray 1; A. III, 19, third spine $1\frac{3}{4}$, fourth ray $1\frac{1}{2}$; least depth of caudal peduncle 3; caudal $1\frac{3}{4}$, hind edge convex; pectoral 1, reaches half way to caudal base, rays II, 13; ventral I, 5, fin $1\frac{1}{2}$ in head.

Color when fresh in alcohol black. Front half of dorsal white. Head and trunk more or less blackish brown. Iris blackish. Lips broadly black. Teeth pale to white. Hind margin of caudal whitish, more broadly so above and below. Pectoral gray.

A.N.S.P., no. 72076. Aguni Shima, Riu Kiu Islands. July 27. Length 93 mm. Type.

Only the type secured. It appears to represent a species distinct from *Zebrasoma rhombeum* (Kittlitz) in that when freshly received it was without the pale blue or whitish dots or the longitudinal lines of that species. Herre describes a specimen 53 mm. long as "light yellowish brown anteriorly, darker posteriorly, the dorsal light yellowish brown, the anal and caudal dusky brown" evidently intermediate with the xanthic *Zebrasoma flavescens* (Bennett).²⁷

(*supra* above + *albus* white; with reference to the front of the dorsal fin.)

²⁷ Philippine Journ. Sci., vol. 34, no. 4, 1927, p. 443.

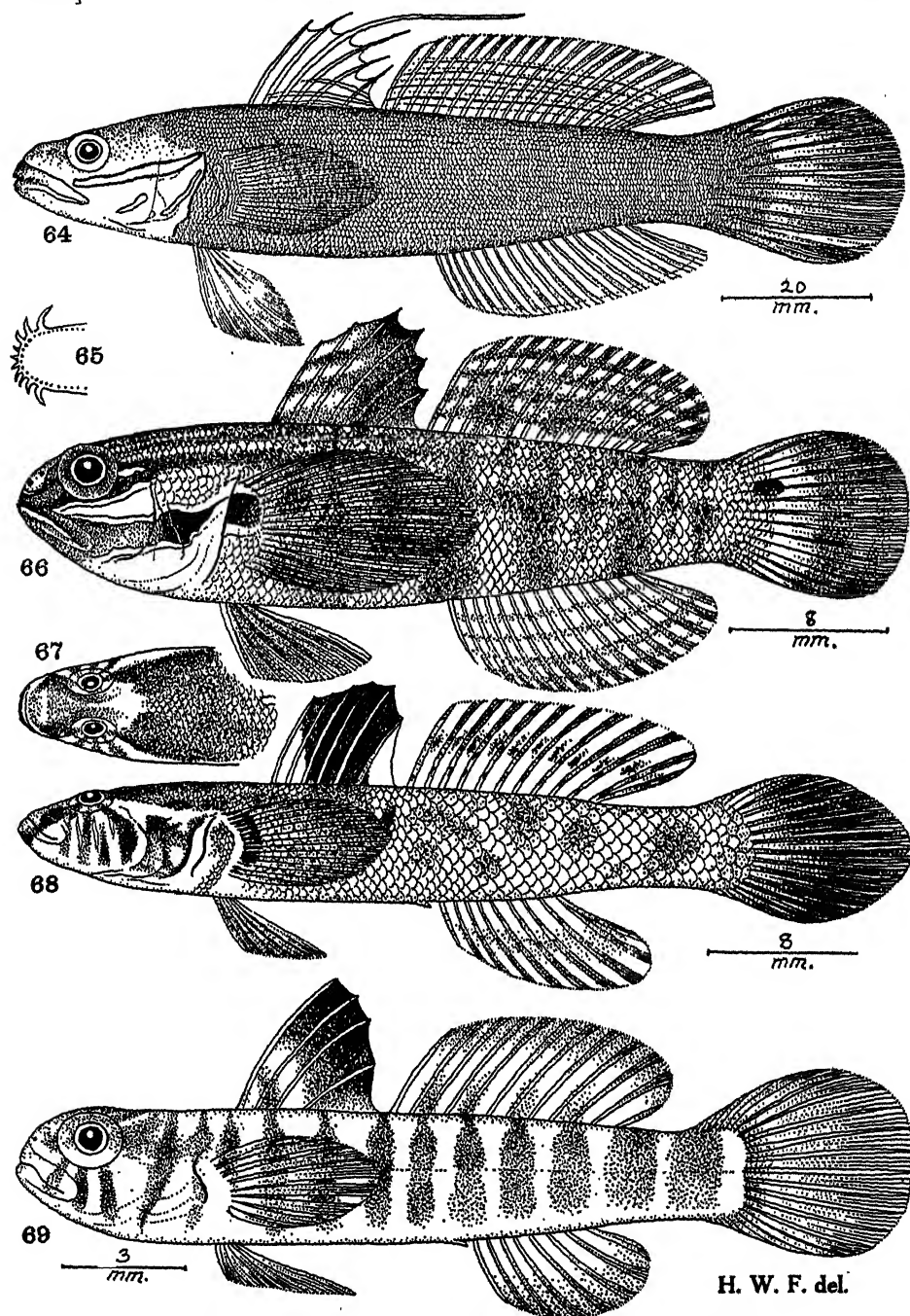


Fig. 64.—*Valenciennesa strigata arcus-branchiae* new subspecies.
 Figs. 65-66.—*Amblygobius phalaena* (Valenciennes).
 Figs. 67-68.—*Doryptera snyderi* new species.
 Fig. 69.—*Agunia quindecim-fasciata* new species.

Naso unicornis (Forskål)

Color in alcohol dark gray brown with 6 rows of dark gray obscure spots. Iris gray, also paired fins. Dorsals and anal largely blotched with blackish. Hind border of caudal whitish. One. 75 mm. July 27.

Resembles Ford's lithograph on pl. 78 fig. D, published by Günther as *Naseus unicornis*, though the dark spots are not so contrasted.

ZANCLIDAE**Zanclus canescens** (Linnaeus)

One, 80 mm., July 27. This differs from the drawing by Canbas as published by Herre, in showing the end of the snout gray black, also a broad black blotch at front of the mandible, besides a bright orange triangular blotch on the side of the snout. In the first broad dark gray transverse band, which is broadly bordered in front and behind with white, marked with a blue gray line from occiput to front of eye, then 2 parallel vertical lines from spinous dorsal down behind eye, front one arching down on front side of breast and posterior from pectoral origin down until close behind black ventral. Second transverse gray black band comprises most of posterior half of dorsal lobe, and bordered with white band its whole extent, even out on anal fin. Broadly in front of it and posteriorly to dark gray caudal body area bright yellow. Caudal with broad white crescentic border behind. Strong spine behind mouth angle each side. It is surely like Nievera's pl. 9 of *Zanclus cornutus* in almost every detail of color pattern. Also two, 75 to 84 mm., July 27, with bright yellow areas on tail vivid.

ELEOTRIDAE**RIUKIUUA** new genus

TYPE.—*Riukiuua poecila* new species.

Body moderately elongated, compressed, with well developed short caudal peduncle. Head large, well depressed, wide as deep. Snout short. Eye only little premedian in length of head, level with end of snout. Mouth large, oblique, closed lower jaw protruded in front. Maxillary long, reaches below front edge of eye. Teeth small, simple, in narrow bands in jaws, which are broader anteriorly. Tongue nearly truncated in front. Interorbital narrow bony frenum. Gill opening lateral, extends down to sides of broad chest below. Scales cycloid, rather large, scarcely smaller on trunk. No lateral line. Head and fore part of trunk naked. Dorsals 2, well separated. Anal similar to and opposite to second dorsal. Caudal rounded behind. Pectoral less than head. Interventral space equal to base length of either of separated ventral fins, which are also shorter than pectorals.

Appears to be related to *Heteroleotris* Bleeker 1874, with reference to *Heteroleotris arenarius* Snyder.²⁸ That species differs in its deeper body,

²⁸ Proc. U. S. Nat. Mus., vol. 36, 1909, p. 100 (type locality, Naha, Okinawa); vol. 42, 1912, pl. 67, fig. 3 (type; scale legend given as " $\frac{1}{4}$ in" would require computed length of type to measure 42 mm., but the original description gives 270 mm.).

shorter caudal peduncle, greatly shorter snout, larger eye, narrowed interorbital, maxillary reaching below eye, very narrowed infraorbital below front part of eye, no dermal flaps on head, larger cycloid scales, ventrals separated and different coloration, but in the fundamental pattern it is, however, suggestive.

(For the Riu Kiu Islands.)

Riukiuia poecila new species

Figures 62 (head above) and 63.

Depth $4\frac{1}{2}$; head 3, width $1\frac{1}{2}$. Snout (in profile) $3\frac{3}{4}$ in head as measured from snout tip, which is level with lower edge of pupil; eye $3\frac{1}{2}$, equals snout; maxillary reaches below front edge of pupil, length $2\frac{1}{2}$ in head measured from snout tip; mouth large, inclined, closed lower jaw projecting in front; teeth very small, simple, conic, little curved, in 2 to 4 irregular series in jaws; 3 or 4 irregular transverse series of small teeth in front of upper jaw; interorbital narrow, with eye entering upper profile of head. Gill opening lateral, its length $2\frac{1}{2}$ in head measured from snout tip.

Scales 29 in lateral count to caudal base; 12 transversely between second dorsal origin and anal origin. Head, predorsal, chest, breast and prepectoral region naked. Head without cirri or cutaneous points.

D. V—12, first spine $2\frac{1}{2}$ in total head length, third ray of second dorsal $2\frac{1}{2}$; A. 10, fin height $2\frac{1}{2}$; least depth of caudal peduncle $2\frac{3}{4}$; caudal $1\frac{1}{2}$, convex behind; pectoral rays 18, fin $1\frac{1}{4}$ in total head length, reaches $2\frac{1}{2}$ to caudal base; ventral rays I, 5, fin $1\frac{1}{2}$ in total head length, separating interspace wide as base of either fin.

Color in alcohol light brown. Muzzle and cheek with small dark brown spots. Five brown rounded spots curved on opercle. Dark brown bar down from lower front eye edge, another over infraorbital and third less distinct from lower hind edge of eye. On body 8 transverse dark brown bands, with more or less imperfect connecting superior streak above middle of side. Last band on caudal base blackish. Two dark brown blotches at prepectoral region. Dorsals and anal pale or whitish, with several dull or darker spots on each spine or ray. Caudal with 2 transverse brown bands, besides basal black band. Pectoral with 4 dark brown bands, first deflected backwards below, and in pale intervals each with several dark spots. Ventral whitish.

A.N.S.P., no. 72080. Aguni Shima, Riu Kiu Islands. July 27, in pools. Type.

Only the type obtained. Characters contained in the generic account above.

(*ποικίλος* variegated, with reference to the pectoral fins.)

Valenciennaea strigata arcus-branchiae new subspecies

Figure 64.

Depth $4\frac{1}{2}$; head $3\frac{3}{4}$, width 2. Snout (in profile) $3\frac{1}{2}$ in head as measured from upper jaw tip; eye $4\frac{1}{2}$, $1\frac{1}{2}$ in snout, subequal with interorbital, lower edge little above level of lower eye edge; mouth large, closed lower jaw with mandible well protruded in front; maxillary extends back below center of eye; narrow part of preorbital width less than eye diameter; teeth in jaws simple, conic, little curved, uniserial, smaller and close set along sides above with 6 canines in front and last lateral tooth little enlarged;

lower teeth largely resemble upper, with 13 front canines of which last 2 laterals largest and inclined back, posterior to which are 4 or 5 low, inconspicuous close-set teeth; palate toothless; tongue rounded in front; inter-orbital space 5 in head from snout tip, slightly convex. Gill opening lateral, its length $2\frac{1}{2}$ in total head length. Gill rakers $0 + 5$, short points, $\frac{1}{2}$ length of gill filaments, which are $\frac{3}{4}$ of eye.

Scales $100 + 10$ in axial lateral series; 28 transversely between second dorsal and anal origins; largely finely ctenoid. Predorsal with naked median band to occiput, also head and front of chest. Of fins only caudal scaly basally.

D. VI, I, 18, 1, third spine ending in filament with length $1 + \frac{1}{4}$ times total head length, longest posterior rays of second dorsal $1\frac{1}{2}$; A. I, 17, 1, fin height $2\frac{1}{2}$; caudal 1, convex behind; least depth of caudal peduncle $2\frac{1}{2}$; pectoral $1\frac{1}{2}$, rays 20; ventral I, 5, fin $1\frac{1}{4}$ in total head length and fins separated.

Color when fresh in alcohol mauve to pale gray brown, lighter below, on tail largely with golden orange tinge. On costal region behind depressed pectoral, 3 slightly inclined equidistant pearly gray lines, each bordered behind with dark gray line, also in first 2 intervals 2 others, both shorter. Muzzle, cheek and opercle above brilliant chrome yellow, bright on muzzle. A pale blue band, bordered with blackish brown line all around, from front infraorbital, below eye and slightly inclined extends up to hind angle of opercle. Blue bar, narrow, in arc of preopercular ridge at lower part of cheek. Short pearly blue bar below and close behind hind edge of preopercle. Subopercle with rather long pearly blue band and subopercle also suffused with golden. Pearly blue transverse band at base of pectoral, followed by parallel yellow band. Iris gray. Inside pharynx black. First dorsal pale gray white with 3 parallel closely set pale reddish longitudinal bands, wide as interspaces. Second dorsal pale orange with 5 scarlet longitudinal parallel equidistant red bands, and very narrow pearly white upper margin. Anal gray white to transparent, with basal suffusion of orange and last ray forming orange red hind border, also submarginal red band with very narrow pearly edge. Caudal brilliant yellow with slight greenish tinge, with 2 orange red longitudinal submarginal bands, which slope slightly towards middle of fin in their posterior extension. Paired fins grayish, with pink tinge basally.

A.N.S.P., no. 72077. Aguni Shima, Riu Kiu Islands. September 5. Length 120 mm. Type. "Living colors pale whitish gray, with dorsal and ventral streaks of rose pink on tail and dorsal fins. Long subocular stripe violaceous blue, with nacreous subvertical bars on gills. Snout chrome yellow." (Tinkham.)

Apparently a distinctive variation from *Valenciennea strigata* (Broussonet), both in its color design as well as in other details. Compared with Mintern's colored lithograph, published by Günther in 1877 as *Eleotris strigata*, that figure differs in the predorsal scaled to the head, the second dorsal spine longest or twice length of head, 2 blue spots behind eye, different disposition of the fin markings and the absence of the 4 costal bars.

(arcus rainbow + *branchiae* gills, with reference to the coloration.)

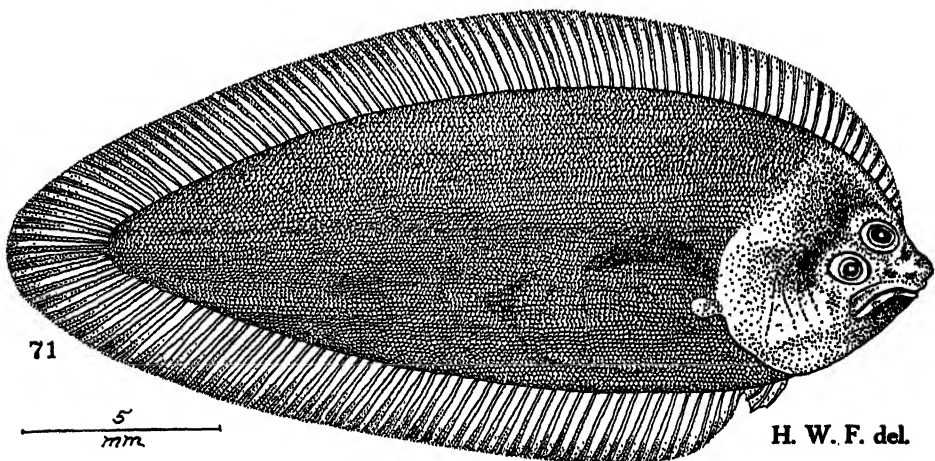
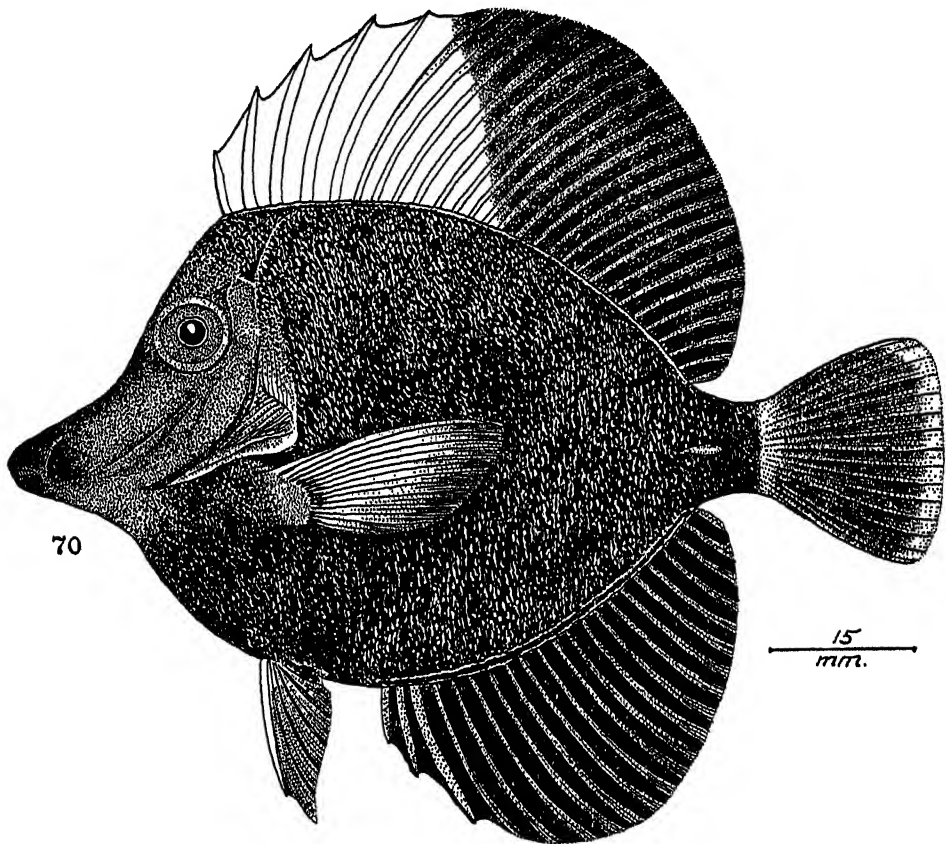


Fig. 70.—*Zebrasoma supra-alba* new species.

Fig. 71.—*Rhinsolea microlepidota* new species.

Eviota zonura Jordan and Seale

Color when fresh in alcohol olive buff, with orange suffusion. From eye 3 brown bars radiate down on lower side of head and 2 angulate toward eye, extending upward and downward on head behind eye. Large dark brown saddle above and behind eyes. On body 10 transverse underlaid grayish bars, narrower than paler interspaces, most distinct along body edges and becoming blackish along lower edge of tail. In penultimate dark bar before caudal base a median round small black spot. Vertical fins brownish, paired fins paler. One, 20 mm., July 27, in a pool; one, 18 mm., August 2; three, 16 to 22 mm., August 7.

Eviota scalei Herre

Scales $21 + 2$ in lateral series. Head and predorsal naked. D. VI—I, 8?; A. I, 6?. Color when fresh in alcohol pale brown. Dark brown transverse shade on hind interorbital space. Dark bar below eye on narrow interorbital space. Obscure deeper brown suffusion over predorsal region. Ten transverse deep brown diffuse bands on body, fifth and sixth at anal base and remaining as distinct dark spots along lower edge of caudal peduncle. One, 24 mm., July 29.

One, 20 mm., August 2. Color when fresh in alcohol brilliant orange with 10 transverse orange vermilion bands, with dark median spot in penultimate. Scarlet orange bar below eye. First dorsal and anal blackish. Second dorsal and caudal grayish. Paired fins whitish.

The type of this species but 13 mm. long and is said to have 8 faint bands on dorsal and ventral surfaces.

GOBIIDAE

Bathygobius fuscus (Rüppell)

Five, 33 to 91 mm., July 27; two, 23 to 29 mm., July 29; four, 19 to 29 mm., August 2. Of the first lot one 39 mm. has: Depth $4\frac{1}{2}$; D. VI—I, 8, 1; A. I, 8, 1; scales $21 + 2$; predorsal scales 9, extend $\frac{2}{3}$ to eyes; 5 upper pectoral rays free; tip of tongue notched. Apparently allied with *Mapo mearnsi* Evermann and Seale,²⁹ but differs in coloration. That species according to its figure has the pectoral with dark spots, no median series of lateral dark blotches, 3 dark blotches at caudal base and body with 6 rather irregular diffuse and obscure dark transverse bands. The smallest specimen obtained July 27 is suggestive of *Bathygobius fuscus pulcher* Fowler³⁰ but differs in having the predorsal scalation extending $\frac{2}{3}$ to eyes and comprising a count of 12 scales. It also differs in details of color, as its pectoral has a large dark brown basal blotch, besides the smaller blackish prepectoral spot and a similar colored dark blotch on the opercle.

²⁹ Proc. U. S. Nat. Mus., vol. 31, 1906, p. 510, fig. 2 (type locality, Zamboanga, Mindanao, Philippines).

³⁰ Proc. Acad. Nat. Sci. Phila., 1945, p. 67, figs. 10-11 (type locality, Saipan Island, Micronesia).

Amblygobius phalaena (Valenciennes) Figures 65 (lower dentition) and 66.

Depth $3\frac{1}{2}$; head $3\frac{1}{2}$, width $1\frac{1}{2}$. Snout (in profile) $3\frac{1}{2}$ in head, tip falling slightly below level of lower edge of eye; eye $3\frac{1}{2}$, greater than snout or interorbital and upper edge impinging on upper profile of head; mouth large, inclined, closed jaws even in front; maxillary $2\frac{1}{2}$ in head, reaches below hind pupil edge; teeth very small, irregularly uniserial, several slightly enlarged above; lower teeth similar, but with 4 enlarged teeth flaring out in front, behind which is a pair of still larger out-flaring recurved canines, one on each side of mandible; interorbital narrow bony width about equals pupil. Gill opening lateral, length 2 in head.

Scales $46 + 5$ in lateral series; 17 transversely from above anal origin. Opercles scaled above. Otherwise than noted head scaleless. Chest, breast, belly and prepectoral with small, ill defined or more or less imbedded scales. Caudal base scaly, fins otherwise naked.

D. VI—I, 14, 1, third spine $1\frac{1}{2}$ in head, fourth ray $1\frac{1}{2}$; A. I, 14, 1, fifth ray 2; least depth of caudal peduncle 2; caudal $1\frac{1}{2}$, rounded behind; pectoral 3 in fish without caudal, rays 15; ventral $1\frac{1}{2}$ in head, rays I, 5, fins united.

Color when fresh in alcohol brown, paler to whitish below. Dark brown band on side of snout to eye, then over postocular and imperfectly along upper side of back to caudal peduncle. Another broader dark brown band from hind end of maxillary to pectoral base and axially along side of body to caudal base. Also 2 dark brown narrow bands above on head, uppermost from nostrils to first dorsal and lower from upper hind eye edge back to base of second dorsal. On head broader ocular and maxillary bands with dark bordering line against a pale or whitish broadly marginal band. Iris dark brownish. On body 4 dark brown transverse bands, each with narrow posterior border of blackish brown. Within pale intervals each with obsolete narrow transverse paler brown band or streak, all crossing dark longitudinal bands. First dorsal pale or whitish with 4 horizontal rather broad dark gray bands and posteriorly fin more or less clouded with gray black. Second dorsal whitish with 4 obsolete horizontal gray bands, lower pair with several alternating gray black blotches. Anal whitish with 4 pale or obsolete horizontal gray bands. Caudal whitish, with black blotch at bases of supramedian rays; fin on outer half with 2 transverse darker bands, anterior of which with several blackish blotches on some of upper and lower membranes. Paired fins whitish.

One, 44 mm., July 27. Mintern's colored lithograph, published by Günther in 1877 as *Gobius phalaena*, is quite different in its spotted head, also the dark spots on the first dorsal and the bands on the second dorsal and anal. The 5 dark green transverse bands on the body are uniformly wide and different from my specimen. Bravo's colored figure, published by Herre³¹ agrees better with Günther's account, but shows a far deeper preorbital and shorter maxillary. The drawing by Clarke, published by McCulloch and Ogilby³² also has a deep preorbital and the coloration more in accord with the above. I give the figure and description above as this stage has only been casually referred to.

³¹ Bur. Sci. Monograph, Manila, no. 23, 1927, p. 235, pl. 30, fig. 3.

³² Records Austral. Mus., vol. 12, no. 10, July 14, 1919, p. 253, pl. 35, fig. 1.

Doryptena snyderi new species

Figures 67 (head above) and 68.

Depth 6; head $3\frac{3}{4}$, width $1\frac{3}{4}$. Snout (in profile) $4\frac{1}{2}$ in head as measured from snout tip, which is slightly below level of eye; eye $4\frac{1}{2}$, subequal with snout, greater than interorbital and impinging on upper profile of head; mouth cleft short, broad, closed jaws with lower well protruded in front; maxillary reaches opposite front edge of eye, long as snout (in profile); teeth minute, villiform, simple, conic, little recurved and in rather broad bands in jaws, comprising 5 or 6 series irregularly as counted transversely; tongue broad, rounded in front; palate toothless and no canines; interorbital width $1\frac{3}{4}$ in eye. Gill opening about 3 in total head length.

Scales $38 + 3$ in lateral series, smaller on trunk and larger on tail; 15 transversely between dorsal base and anal origin; 23 predorsal scales forward $\frac{2}{3}$ to eyes, head otherwise naked. On cheek and preorbital 4 short vertical rows of papillae. Chest naked, though posteriorly or before ventral bases small area of imperfect or imbedded scales, these forming narrow extension upward of each side of pharynx to scalation of prepectoral. Caudal with scaly base.

D. VI—I, 10, 1, fourth spine $1\frac{3}{4}$ in total head length, ninth ray $1\frac{1}{2}$; A. I, 8, 1, seventh ray $1\frac{1}{2}$; least depth of caudal peduncle $2\frac{3}{4}$; caudal 1, extended convexly behind; pectoral $1\frac{1}{2}$, rays 11; V. I, 5, fin $1\frac{1}{2}$ in head.

Color when fresh in alcohol pale brown, inclining to whitish below. Trunk and tail with subdued darker brown blotches, variable and little defined. Dark brown band from side of snout to eye, also one over front of mandible, and then over postocular to gill opening. Iris dark gray. On cheek 4 dark brown vertical bands radiating down from eye, last or posterior deepest colored. Opercle with several dark brown connected bars. Several brown spots on predorsal. First dorsal largely gray black, whitish in front and behind and with dark color reflected down on back. Second dorsal and anal whitish, with median longitudinal dark or brown band and each ray with several brown spots. Caudal gray black. Pectoral pale, with several brown blotches and transverse blackish brown basal band. Ventral whitish, with 3 pale brown bars.

A.N.S.P., no. 72078. Aguni Shima, Riu Kiu Islands. July 27. Length 45 mm. Type.

Only the type obtained. Appears distinct from *Doryptena okinawae* Snyder³³ as that species has smaller scales, about 50, the head with many conspicuous beaded dermal flaps and ridges, a narrow truncated tongue, teeth in narrow bands in jaws and the breast naked. The figure differs from the present species in showing the closed jaws even in front, mouth subvertical, a greatly deeper preorbital, no scales on predorsal, chest and prepectoral region, enlarged caudal scales and different coloration, especially with white spots over greater part of side of head. The figure Snyder gives does not show the 4 conspicuous vertical parallel dark bars along the lower side of the cheek, the other markings on the head are also different and the dark spots on the vertical fins much less numerous.

(For the late Professor John O. Snyder, in appreciation of his papers on Riu Kiu fishes.)

³³ Proc. U. S. Nat. Mus., vol. 35, 1908, p. 103 (type locality, Naha, Okinawa); vol. 42, 1912, p. 513, pl. 67, fig. 2 (type).

Zonogobius boreus Snyder

One, 11 mm., July 27, in pool.

Gobiodon coryphaenula (Valenciennes)

Thirteen, 26 to 33 mm., August 7. "Living colors bluish green. Fish hide in corals, must be jarred out to capture." (Tinkham.)

Two, 31 or 32 mm. Same data. Color in alcohol uniform gray brown. Dark vertical bar down through eye over cheek. Small black spot on opercle point opposite origin of pectoral fin.

AGUNIA new genus

TYPE.—*Agunia quindecim-fasciata* new species.

Body well elongated, uniformly deep, moderately compressed. Head obtuse. Snout with conspicuous convex surface, rounded and without median cutaneous keel. Eye large, well advanced in head. Mouth terminal, little inclined and closed lower jaw protruding. Maxillary reaches well below eye, separated by narrow preorbital from eye. Teeth rather large, firm, simple, in a single or but few series. Gill opening lateral, small, close before pectoral base. No scales. Vertical fins moderate, the dorsals well separated. Caudal rounded. Paired fins moderate. Coloration with dark cross bands.

Small slender tide pool gobies, differing from the Philippine *Itbaya Herre*³⁴ chiefly in their less slender body, larger paired fins, different physiognomy and the barred coloration.

(For Aguni Shima.)

Agunia quindecim-fasciata new species

Figure 69.

Depth $5\frac{1}{2}$; head 4, width $1\frac{3}{8}$. Snout well convex, length (in profile) $4\frac{1}{2}$ in head measured from snout tip, which is level with lower edge of eye; eye $2\frac{3}{8}$, greater than snout or interorbital, almost reaching upper profile of head; mouth broad, cleft short, closed jaws with lower little protruding in front; maxillary reaches opposite front edge of pupil, length (in profile) $2\frac{1}{2}$ in head; teeth simple, conic, little curved back, irregularly biserial or even triserial in front of jaw, narrowing to uniserial laterally; palate apparently toothless; interorbital narrow bony frenum, little convex, width $2\frac{1}{2}$ in eye. Gill opening subequal with eye.

No scales, skin smooth.

D. IV—11, first spine $1\frac{1}{10}$ in total head length, fifth ray $1\frac{1}{8}$; A. I, 7, fourth ray $1\frac{3}{8}$; least depth of caudal peduncle 2; caudal $1\frac{1}{10}$, rounded, with upper fulcrum better developed; pectoral 1, rays 8; ventral I, 5, fins united, length $1\frac{1}{8}$ in head.

Color when fresh in alcohol pale brown. Eleven slightly darker gray transverse bands, each broader than pale intervals on body. Head with 4 transverse dark brown cross bands of which 3 radiate down from lower eye edge. Dark band connects eyes, and short dark bar below eye. Dorsal and anal more or less dark gray terminally and transverse body bands extending on fin bases. Other fins pale brown, with gray terminally on second dorsal and anal.

³⁴ Bur. Sci. Manila, Monograph no. 23, Sep. 15, 1927, p. 288.

A.N.S.P., no. 72079. Aguni Shima, Riu Kiu Islands. July 27. Type.

Only the type secured. Distinctive characters contained in the generic account above.

(*quindecim* fifteen + *fascia* band.)

SCORPAENIDAE

Scorpaena tinkhami new species

Figure 72.

Depth $2\frac{1}{2}$ to $2\frac{3}{4}$; head $2\frac{1}{2}$ to $2\frac{3}{4}$, width $1\frac{1}{2}$ to $1\frac{1}{2}$. Snout (in profile) $3\frac{1}{2}$ to $4\frac{1}{2}$ in head from snout tip, which is nearly level with origin of pectoral fin; orbit 3 to $3\frac{1}{2}$; eye $3\frac{3}{4}$ to 4, greater than snout or interorbital; mouth large, little inclined, closed lower jaw slightly protrudes in front; maxillary reaches opposite eye center or to hind pupil edge, expansion $1\frac{3}{4}$ to 2 in eye, length 2 to $2\frac{1}{2}$ in head from snout tip; teeth finely and minutely villiform, in bands in jaws, triangular line on vomer and narrow band on each palatine; interorbital concave, with deep median groove, bony width $4\frac{1}{2}$ to 6 in head from snout tip. Gill opening extends forward opposite front pupil edge. Gill rakers 6 + 11, short tubercles, all of upper and most of lower ones mere low rudiments.

Pair of rather large antero-supraocular spines; median supraocular pair broad, followed on same level by 2 pairs of spines of which posterior or tympanic pair slightly larger, and finally by parietal pair and nuchal pair, last slightly more widely set; 2 small close-set postoculars behind upper hind rim of each orbit; large spine little lower than postoculars at upper end of each preopercle limb; pair of strong nasal spines, close behind each of front nostrils; preorbital with 4 spines, third largest and arching over maxillary; small spine on lower edge of orbit; suborbital stay without distinct spines except last one at preopercle ridge; preopercle with 6 spines, uppermost as pair at end of suborbital stay, with hindmost much largest; 2 opercular spines, upper larger; suprascapular spine rather large, with still larger spine in front and another close above; strong spine close above pectoral base.

Scales ctenoid, 32 close along above lateral line to caudal base and 3 more on latter; tubes 23 or 24 in lateral line to caudal base; 6 or 7 scales above lateral line to front of first dorsal base, 10 below to anal origin. Bases of rayed vertical fins more or less scaly. Head scaly above and on sides, also chest, breast, prepectoral region and belly, though on most all of these locations small and crowded in appearance. Head and body without cutaneous flaps or cirri.

D. XII, 10, fourth spine $2\frac{1}{2}$ to $2\frac{1}{2}$ in total head length, second dorsal spine 3 to $3\frac{1}{2}$, third ray of second dorsal $2\frac{1}{2}$ to $2\frac{3}{4}$; A. III, 5, second spine 2, third ray 2 to $2\frac{1}{2}$; least depth of caudal peduncle $3\frac{3}{4}$ to $4\frac{1}{2}$; caudal $1\frac{1}{2}$ to $1\frac{1}{2}$, convex behind; pectoral $1\frac{1}{2}$, rays 1, 5 or 6, 9 or 10; ventral I, 5, fin $1\frac{1}{4}$ to $1\frac{1}{2}$ in total head length.

Color when fresh in alcohol brown, paler to whitish on under surface of head and belly. About 5 obscure darker or blackish brown cross bands, more or less ill defined. Head and body also with many variable darker spots, often smaller and more numerous on belly, and some also invading dark transverse bands. Iris warm brown or grayish. All fins with more or less pale to whitish ground color and spotted with dark brown, blackish brown or gray black. On pectoral spots small, very numerous and small basally.

A.N.S.P., no. 72081. Aguni Shima, Riu Kiu Islands. July 27. Length 71 mm. Type.

A.N.S.P., no. 72082 and 72083. Same data. Length 68 to 90 mm. Paratypes.

Distinguished by its heavy armature, the spines on the head large, and also the dorsal and anal spines ample. It differs from *Scorpaena izensis* Jordan and Starks³⁵ not only in many details of structure but also coloration. Likewise *Scorpaena onaria* Jordan and Snyder,³⁶ also both species greatly larger in size.

(For Captain Ernest R. Tinkham.)

Scorpaenopsis kagoshimanus (Steindachner and Doederlein)

Palatines toothless. Cheek scaleless. D. XII, 10; A. III, 5, 1; pectoral rays 17, all simple. Color in alcohol quite dark, with black blotch at greater front part of first dorsal. Another from second dorsal down to embrace posterior half of spinous anal and most of rayed anal, besides transverse black basal band on caudal and another subterminal on same fin. One 41 mm., August 7, in pool.

Much more contrasted than Knopicky's lithograph, published by Steindachner and Döderlein as *Scorpaena kagoshimana*.³⁷

Pterois volitans (Linnaeus)

Figure 29.

Color when fresh in alcohol brilliant yellow, with 6 deep brown transverse bands on body, last little inclined from horizontal on middle of caudal base. Fins whitish, with black blotches. One, 18 mm., July 27.

SOLEIDAE

RHINOSOLEA new genus

TYPE.—*Rhinosolea microlepidota* new species.

Body elongately ovoid, with long tail tapering narrowly to base of caudal; general appearance pellucid, but with more or less areas of opacity. Head moderate, deep. Eyes moderately large, close together, upper with front half in advance of lower. Mouth large, cleft arched and lower jaw shorter or included as closed. Gill opening moderate. Scales very minute. Apparently a single axial lateral line. Dorsal, anal and caudal fins all closely confluent, without leaving a distinct caudal peduncle. Caudal fin small, pointed, rays 8. Pectoral only evident as slight rudiment. Ventral very small. Dorsal and anal fins rather well elevated.

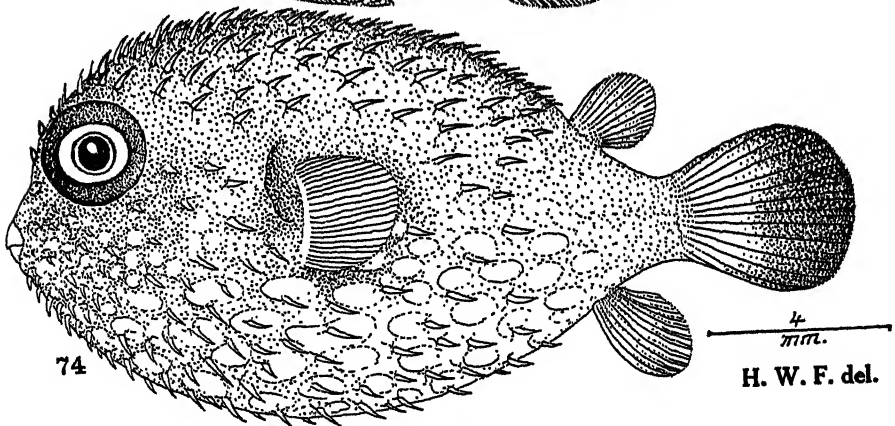
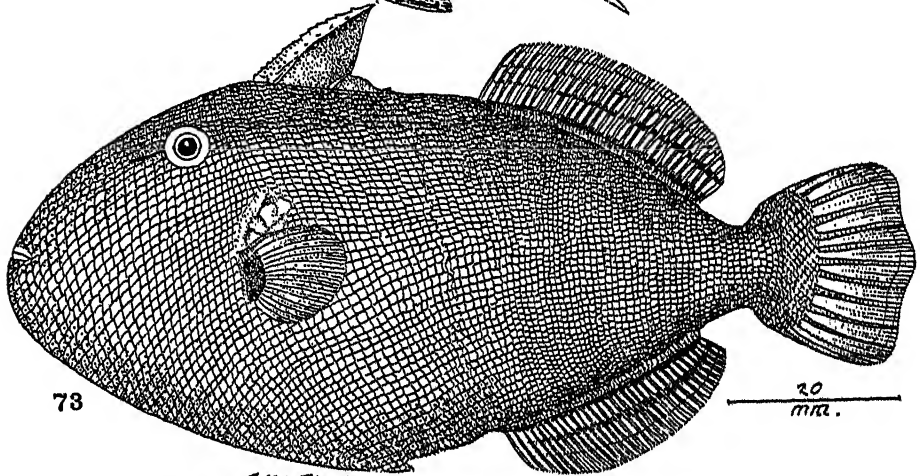
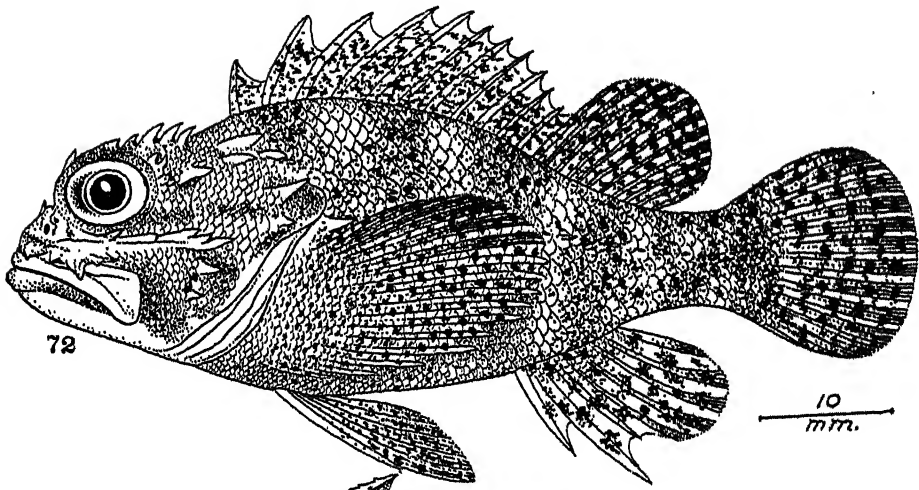
Though with rudimentary pectoral this genus seems to approach *Zebrias* Jordan and Snyder and *Aesopia* Kaup in its confluent vertical fins, but differs in its uniform coloration, and very different physiognomy.

(β iv snout + *Solea*.)

³⁵ Proc. U. S. Nat. Mus., vol. 27, 1904, p. 134, fig. 10 (type locality, Suruga Bay; Totomi Bay; Japan. in 45 to 100 fathoms).

³⁶ Proc. U. S. Nat. Mus., vol. 23, 1900, p. 365, pl. 16 (type locality, Tokyo).

³⁷ Denks. Akad. Wiss. Wien, vol. 53. 1887, p. 296 (explanation of figures), pl. 3, figs. 1-1a.



H. W. F. del.

Fig. 72.—*Scorpaena tinkhami* new species.
Fig. 73.—*Oncobalistes erythropterus* new species.
Fig. 74.—*Diodon hystrix* Linnaeus.

Rhinosolea microlepidota new species

Figure 71.

Depth $2\frac{3}{4}$; head $3\frac{1}{4}$, width $2\frac{1}{4}$. Snout measured to lower eye, $3\frac{3}{4}$ in head; lower eye $4\frac{1}{4}$, $1\frac{1}{2}$ in snout; mouth scarcely inclined from horizontal, cleft reaches opposite middle of lower eye; teeth not evident; interorbital narrow bony frenum. Gill opening cleft low, not extended upward above level of mouth.

Scales not very distinct, estimated about 100? in median lateral series between head and caudal base, apparently cycloid. Scales little evident on head. Lateral line? axial, straight.

D. 75?; fin apparently beginning over front part of eye, greatest height $2\frac{1}{2}$ in head; A. 64, similar to dorsal. Caudal with 8 rays, united with dorsal and anal, length $2\frac{1}{2}$ in head. Paired fins little developed, ventral apparently with 3 short rays.

Color when fresh in alcohol somewhat opaque pale brown to whitish. Visceral cavity showing through grayish. Irides whitish. Vertical fins whitish, rays with variable grayish spots or specks, most conspicuous terminally.

A.N.S.P., 72084. Aguni Shima, Riu Kiu Islands. July 29. Length 24 mm. Type.

Only the type secured. Characters above.

(*μικρός* small or minute + *λεπίς* scale.)

PARAPERCIDAE**Chilias hexophtalma** (Ehrenberg)

Color in alcohol with back pale drab, sides yellowish and under surfaces whitish. Head above and over sides with small black spots, rather evenly distributed and all more or less ocellated with yellowish. Although 3 of the ocelli continue forward along and below lower edge of preopercle, most of under surface of head otherwise immaculate white. Iris gray. Two parallel, well spaced, blackish lines longitudinally on body, more or less made up of black spots and less distinct in the intervening sections; these black lines crossed by 9 more or less equidistant dark drab vertical bars, not extended below to ventral or to anal fins, but in the lower sections (below lower dark longitudinal line) with a black ocellus, border yellow, and several duplicated or as close set pair. Back above dark line with 2 very irregular longitudinal rows of variable small black spots. In oblong pale areas formed along middle of side 1 to 3 close-set small black spots; also resulting pale intervals below lower blackish longitudinal line with 1 or 2 dark drab spots. Dark to blackish arc or blotch before pectoral base and 2 black spots on latter. Dorsals yellow, spinous fin with broad black median band and submarginal black line. Soft dorsal with 3 rows of black spots. Anal yellow, with median row of black spots, one on each membrane, and detached ends of lower border dark drab tipped with white. Caudal black over greater median area, border all around yellow with little drab suffusion below and behind. Paired fins yellow. One, 111 mm., July 27.

The above note is at variance with Ford's lithograph published as *Percis hexophtalma* by Day. It has the black caudal blotch smaller. *Parapercis atramaculata* Fowler³⁸ is surely closely related, if not the same.

³⁸ Journ. Acad. Nat. Sci. Phila., ser. 2, vol. 12, 1904, p. 548, pl. 24 (not 18 as stated in text), lower figure (type locality, Padang, Sumatra).

Chilias synphodesmus new species

Figure 38.

Depth 4; head 3, width $1\frac{1}{2}$. Snout (in profile) $2\frac{1}{4}$ in head measured from snout tip, which is level with center of eye; eye $3\frac{1}{4}$, $1\frac{1}{2}$ in snout, over twice width of interorbital; mouth oblique, closed jaws with lower slightly projecting; maxillary reaches opposite front edge of eye, its length $2\frac{1}{4}$ in head, measured from snout tip; patch of upper anterior villiform curved teeth, followed each side with narrow close-set series of small teeth, with canine each side anteriorly; lower teeth similar, fewer in anterior patch and pair of canines anteriorly; interorbital width 2 in orbit; preopercle edge entire; 2 strong spines on opercle. Gill opening extends forward opposite last third in head. Gill rakers 5 + 8, low points, greatly less than gill filaments which 2 in eye.

Tubular scales 50 in lateral line to caudal base; 5 above to spinous dorsal origin, 17 below to anal base; 6 predorsal. Pectoral axil with pointed cutaneous flap. No axillary pectoral scale. Caudal base scaly nearly to middle of fin. Head with cheeks and opercular scales about 6 rows below eye on cheek. Lateral line complete, slightly inclined, with simple tubes.

D. V, 21, third spine $2\frac{1}{2}$ in total head length, first ray $2\frac{1}{10}$ and membranes each notched marginally; A. I, 17, spine $4\frac{1}{10}$, fifth ray $2\frac{1}{4}$; least depth of caudal peduncle 3; caudal $1\frac{1}{2}$, hind edge convex; pectoral $1\frac{1}{2}$, rays II, 13; ventral I, 5, subequal with head and membranes well notched.

Color when fresh in alcohol yellowish olive above, sides below and under surfaces whitish. No distinct or definite yellowish lateral band. Dark brown line on side of snout to eye and continued over postocular above. Two brown blotches on upper lip and short dark bar on hind end of maxillary, continued from larger dark blotch on preorbital. Anteriorly lower lip with pale brown bar, otherwise mandible white, with 2 median small well separated black spots, besides similar one behind hind end of maxillary and another at hind articulation of mandibular ramus. Broad black band, narrowing below, till opposite small black spot ocellated with brown, below front branchiostegals, and on them also larger brown bar. Below preopercular edge large blackish brown blotch on subopercle, also small blackish blotch before lower preopercle spine. On side of breast greatly contrasted blackish brown band extends down narrowing to cross over breast. Ten dark brown saddle-like blotches, each with pair of round black spots which reach narrowly on base of dorsal fin. Irregular undulated dark brown line more or less connects dark saddles and in loop resulting each gives off dark line downwards to form as many (10) blackish brown bars along lower side of abdomen and tail, these transverse bands cross over or are united on belly and also extend on base of anal fin. Where the dark bands expand on the lower flank they are traversed by a longitudinal dark band and there is also another parallel, above, but less definite. Spinous dorsal brilliant orange red, with a broad black median longitudinal band over second to fourth membranes. Soft dorsal yellow, with 4 round black spots on each membrane. Anal bright yellow, with a median series of black spots, one on each membrane and besides the invading dark ends of the black transverse bars, variably 1 or 2 dark spots subbasally also on each membrane. Caudal yellow with 6 transverse series of small blackish spots, some of median larger and ocellated and hind edge of fin narrowly white, with narrow blackish submargin. Pectoral yellowish olive, with

several brown spots basally. Ventral yellow, with small scattered deep brown ocellated spots on its outer or posterior face, while inner with only 1 or 2 small dark spots basally.

A.N.S.P., no. 72085. Aguni Shima, Riu Kiu Islands. July 27. Length 98 mm. Type.

Compared with *Percis tetracanthus* as recorded by Kner and Steindachner in 1866 from Samoa, publishing Knopicky's lithograph, the latter differs strikingly in showing 12 scales on cheek below eye, 7 in my species; no lower opercular spine, large lower opercular spine in my specimen; squamous area on pectoral base narrow and but little encroaching on fin, squamous area nearly $\frac{1}{3}$ of fin in my specimen; soft dorsal and anal fin edges very narrowly incised, deeply incised in my specimen. Although probably variable in the details in coloration different and distinctive. The colored figure Günther published in 1876 from Garrett's material also differs greatly in color pattern, neglecting details of the opercular spines, greatly advanced ventral fin, though the large scales below the eye are in agreement.

(*συνὰφής* united + *δεσμός* band.)

BALISTIDAE

ONCOBALISTES new genus

TYPE.—*Oncobalistes erythropterus* new species.

Body elongately ovoid and compact in contour, well compressed, with tail greatly shorter than rest of fish. Snout long. Eye small, elevated. Mouth with very short gape, broad. Lower jaw slightly protruded in front. Scales finely roughened. Tail without very distinct armature. Dorsal with strong spine, spiniferous, in front part of first fin, reaches when depressed $1\frac{1}{3}$ to second dorsal origin. Anal similar to and opposite second dorsal. Caudal and pectoral rounded, latter small. Ventral spine a little movable.

Related to *Balistes* Linnaeus, but differing in smaller size, dorsal and anal fins not lobate in front, small scales (10) between eye and gill opening, strong dorsal spine with 2 series of antrorse spines along its front face and row along each side and reaches when depressed $1\frac{1}{3}$ to dorsal origin and the ventral spine moveable.

(*ὄγκος*, hook, or barb, with reference to the first dorsal spine, + *Balistes*.)

Oncobalistes erythropterus new species

Figure 73.

Depth 2; head $3\frac{1}{3}$, width 2. Snout $1\frac{1}{3}$ in head from snout tip and upper profile slightly convex; eye 5, 4 in snout, 2 in interorbital; preorbital groove long as eye; mouth cleft short or $\frac{2}{3}$ of eye or $\frac{1}{3}$ of mouth width, superiorly terminal with mandible slightly protruding in front; lips narrow, largely cover closed jaws; teeth moderate; interorbital width $2\frac{1}{3}$ in head from snout tip, convex. Gill opening $2\frac{1}{3}$ in snout, followed by 3 or 4 ossicles, more or less with radiating striae.

Scales 55 in lateral series between gill opening and caudal base, and 10 more on latter; 35 transversely above anal origin; 27 before pectoral. Scales all more or less minutely asperous, and on sides of tail most of scale rows with small spine at junctures forming longitudinal rows.

D. III—31, spine $1\frac{1}{2}$ in head, armed with 2 parallel rows of antrorse spines along front edge and row along each side, second fin height $3\frac{1}{2}$ in head; A. 31, fin height 3; least depth of caudal peduncle 3; caudal $1\frac{1}{2}$, hind edge convex; pectoral 2, rays I, 15; ventral spine small, movable, spinescent.

Color when fresh in alcohol dark to blackish brown, with slight dark orange tinge on head above and on front of back; below pectoral and on tail darker to blackish suffusion. Iris dark warm gray. Spinous dorsal largely black, slightly brownish basally. Soft dorsal orange red, squamous base black like body and fin with 4 equidistant narrow blackish bands. Anal similar to soft dorsal, but with only 2 black nearly equidistant narrow longitudinal bands. Caudal reddish black, with slightly more red border above and behind posteriorly. Pectoral orange red, base black.

A.N.S.P., no. 72087. Aguni Shima, Riu Kiu Islands. July 27. Length 105 mm. Type.

Only the type obtained. Apparently different from the related Hawaiian *Pachynathus nycteris* Jordan and Evermann, but also congeneric [—*Onco-balistes nycteris* (Jordan and Evermann)]. It differs from Baldwin's drawing of the type, published by Jordan and Evermann as *Balistes nycteris* in 1905. That species shows first dorsal spine reaching $2\frac{3}{4}$ to second dorsal origin and without antrorse barbs, basal pectoral scales 8 in vertical series (20 in *O. erythropterus*), pectoral rays II, 15 (I, 13 in both fins in *O. erythropterus*), 22 scales between rictus and gill opening (30 in *O. erythropterus*), orbit $1\frac{1}{2}$ to gill opening ($1\frac{1}{2}$ in *O. erythropterus*).

(ἐρυθρός red + πτερὸν fin.)

Balistapus undulatus (Mungo Park)

Color when fresh in alcohol dark olive with reddish tinge and with blackish markings, especially parallel blackish lines obliquely across check. Iris dark gray. Spinous dorsal membranes gamboge orange, with 2 upper forward black spots. Vertical fins and pectoral orange basally, membranes of dorsal and anal yellowish gray. Caudal greenish yellow terminally, and lower portions of fin orange. Base of each dorsal and anal ray with short black bar. One, 143 mm., July 27.

Balistapus aculeatus (Linnaeus)

One, 23 mm., July 27; one, 27 mm., August 7, in pool.

Balistapus rectangulus (Linnaeus)

Color when fresh in alcohol with 2 obscure pale blotches below first dorsal on back. Three dark blotches on back at base of second dorsal, first at its origin, second median and third at last rays. On caudal peduncle pale-edged black triangle, angle pointed forward and longer than base. From last rays of dorsal and anal 2 dark lines, pale bordered on each side, converge forward until joining opposite end of depressed pectoral, then extend slightly inclined forward until above large scales behind gill opening. Black band across interorbital, then down from eye and narrowing to pectoral axil and ends as dark blotch on pectoral base. Blackish area extends up from vent to embrace all of region before inclined angle described above, pale bordered converging lines. Three, 35 to 125 mm., July 27.

MONACANTHIDAE***Oxymonacanthus longirostris* (Schneider).**

Color when fresh in alcohol bright blue green, with 8 longitudinal rows of brilliant golden orange spots, rows broader on lower part of body. Whole posterior half of body strongly tinged with orange. Ventral flap with dark gray area, marked with some pearly spots. Iris reddish, with 6 bluish spots, each edged darker. Fins grayish, with 2 transverse darker gray bands, basal broader and outer one with blackish inframedian rays. One, 83 mm., July 27. D. I—32; A. 30.

One, 80 mm., September 4.

OSTRACIIDAE***Ostracion sebae* Bleeker**

Color when fresh in alcohol with small blue dots very numerous, closely set on back, about 18 transversely at widest part of carapace, blue spots less numerous on sides, and below only extend on under surface around anal where they are bright golden yellow. Spots on sides posteriorly, on caudal peduncle where forming ocelli, and on caudal, golden. Base of dorsal broadly black, greater terminal part of fin contrasted gray. Pectoral gray, but basal area livid black all around. One, 105 mm., June 27.

DIODONTIDAE***Diodon hystrix* Linnaeus**

Figure 74.

Frontal spines little shorter than eye or post-pectoral spines.

Color when fresh in alcohol gray above and on sides, below whitish. Lower lip and bar across chin dark gray. Iris yellowish white and eye within black blotch extending down to cheek. Black blotch, little larger than eye before gill opening. Broad transverse black band across head behind eyes and opposite prebranchial black blotch. Large black blotch above each gill opening. Another posteriorly and before dorsal, also dorsal inserted in black blotch. All black blotches have a white bordering line. Fins yellowish, caudal little more grayish. One, 170 mm., July 27.

Young with 4 spines as counted across interorbital space, 17 predorsal and 17 transversely across belly. Color in alcohol dark amber brown, more or less uniform on back. Lower sides and belly with numerous rather large close set gray white spots or blotches, largest medially on lower sides. Iris gray white. Dorsal and anal gray white. Caudal dark gray brown. Pectoral gray. One, 19 mm., July 29.

ANTENNARIIDAE***Antennarius niveus* new species**

Figure 75.

Depth $1\frac{1}{2}$ (body retracted); head 2, width $2\frac{1}{4}$. Snout (in profile) $6\frac{1}{2}$ in head; eye $8\frac{1}{4}$, $1\frac{3}{4}$ in snout, lateral; maxillary subvertical, length $2\frac{3}{4}$ in head, expansion $1\frac{1}{4}$ times eye diameter; teeth rather slender, long anteriorly and more numerous in front above, uniserial and gradually smaller on sides of jaws; lower teeth uniserial, graduated shorter along sides of jaws; narrow band of teeth on vomer and palatines; interorbital width 3 in head as measured from snout tip, convex. Gill opening a small pore.

Skin minutely asperous or velvety. Scattered white small or minute papillae chiefly on head and back above.

D. I—I—12, rays all simple, bait with small spherical bulb giving off a simple filament shorter than eye, second spine but slightly longer than ray of bait, third spine $2\frac{1}{2}$ in head as measured from front end of snout, seventh ray $2\frac{1}{2}$; A. 7, with last 4 rays bifid, fourth ray 3 in head; least depth of caudal peduncle $3\frac{1}{2}$; caudal $2\frac{1}{2}$, six principal rays bifid; pectoral $2\frac{1}{2}$, rays 9, all simple and terminal third of most rays free but with membranes rather deeply incised; ventral 5, rays simple and membranes deeply incised.

Color when fresh in alcohol dull brown with darker to blackish brown variable areas, all more or less with rounded pale areas producing dappled appearance. Five dark brown bars radiate from light gray iris into dark brown bands. On back several more or less defined as dark transverse bands, first from third dorsal spine, second and third from rayed dorsal and dark transverse band on caudal peduncle. On abdomen and lower surfaces many variable rounded pale spots or blotches. Soft dorsal with 2 black spots slightly larger than eye. Caudal whitish basally, fin otherwise grayish black, with 4 transverse rows of black spots. Anal dark brown, with black spots forming horizontal series. Pectoral gray on under surface, membrane dark and ends of rays each with black spot. Pectoral whitish, each ray with several black spots, also upper surface blackish. Bait with ray whitish, bulb blackish. Sprinkled over the upper surfaces, chiefly on head and trunk, are innumerable small whitish spots.

A.N.S.P., no. 72088. Aguni Shima, Riu Kiu Islands. July 27. Length 42 mm. Type.

A species differing in its deeply emarginated membranes of the paired fins, leaving the ends of the rays well freed. It approaches Spengler's colored figure published by Bleeker as *Antennarius coccineus*³⁹ in its short bait, but differs in coloration and the absence of tentacles on the throat.

(*niveus* snowy, from the white dots or spots.)

***Antennarius punctatissimus* new species**

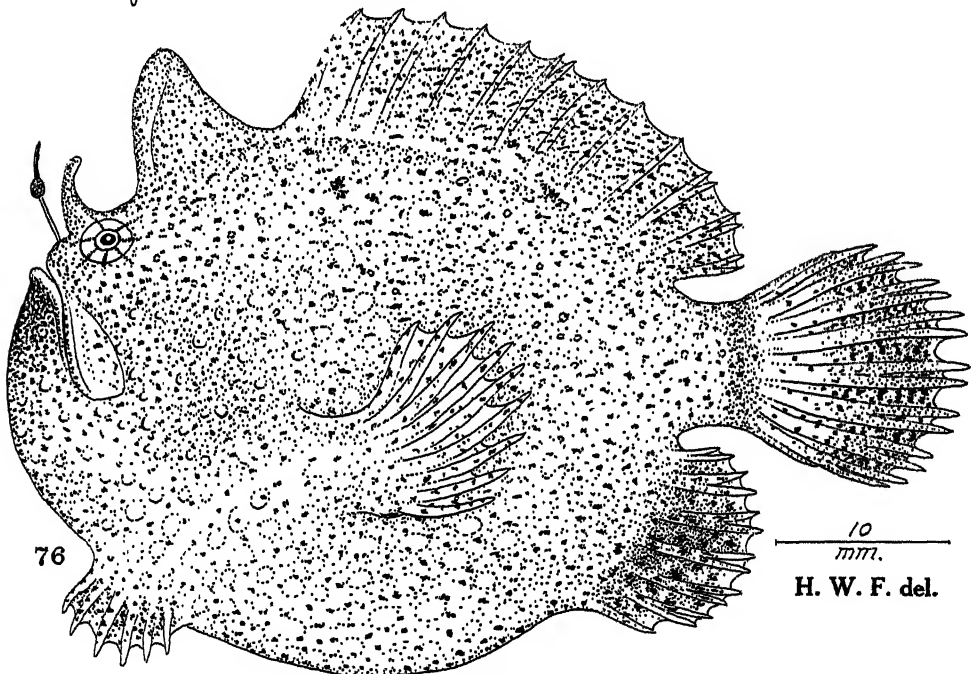
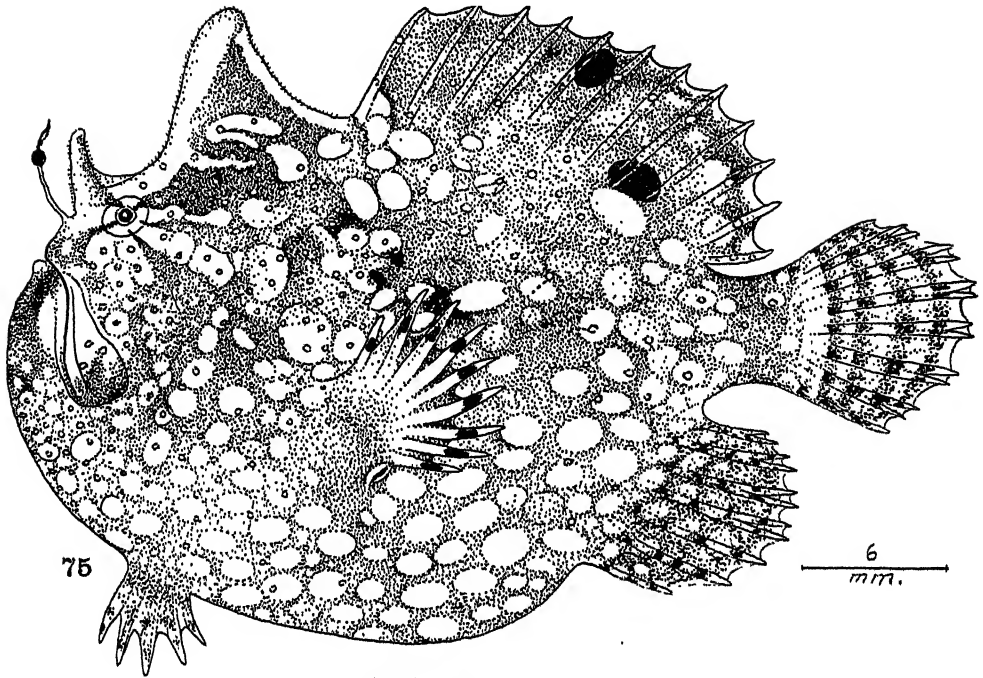
Figure 76.

Depth $1\frac{1}{2}$ (body retracted); head $1\frac{1}{2}$, width $2\frac{1}{2}$. Snout (in profile) 10 in head; eye 8, greater than snout, lateral; maxillary subvertical, $2\frac{1}{2}$ in head as measured from snout tip, expansion subequal with eye diameter; teeth uniserial in jaws, simple, conic, close set, graduated smaller on sides of jaws; narrow band of small teeth on vomer and palatines; interorbital width 5 in head as measured from snout tip, convex. Gill opening small pore.

Skin minutely asperous or velvety. Very small scattered white cutaneous papillae, principally above.

D. I—I—I—12, sixth, tenth, eleventh and twelfth rays bifid, bait with small globular bulb and giving off simple filament shorter than eye, third spine $2\frac{1}{2}$ in head as measured from snout tip, sixth ray 3; A. 7, all but first ray bifid, fourth ray $3\frac{1}{2}$; least depth of caudal peduncle 2, 6 principal rays bifid; caudal 2, with 6 principal rays bifid; pectoral 2, rays 9, all simple and terminal third of most free and with membranes deeply incised; ventral 6, with membranes moderately incised.

³⁹ Atlas Ichth. Ind. Néerl., vol. 5, 1865, p. 22, pl. (4), 197, fig. 2.



H. W. F. del.

Fig. 75.—*Antennarius niveus* new species.Fig. 76.—*Antennarius punctatissimus* new species.

Color in alcohol drab or grayish, with many paler to whitish rounded spots, chiefly on abdomen. Whole body and fins with very numerous variably darker gray specks, dots and spots, smallest and most numerous on fins and about chin and throat. Many very small white spots, each representing a minute papilla scattered over upper surfaces. Iris grayish and little defined from rest of head. Caudal and anal fins with slightly more gray black ground color than other fins.

A.N.S.P., no. 72089. Aguni Shima, Riu Kiu Islands. July 27. Length 57 mm. Type.

Related to the preceding species in most structural details but differs chiefly in coloration and its color pattern.

(*punctatissimus* greatly dotted.)

Note.—In the above collection Captain Tinkham included a small specimen from Saipan Island and as this species has not been reported from there before I include it.

***Pomacanthus imperator* (Bloch)**

One, 30 mm., May 8, 1945. It agrees largely with my figure of a Philippine specimen.⁴⁰ I may also mention that in my report on Captain Tinkham's collection of Saipan Island fishes⁴¹ I neglected to call attention to Pellegrin's paper in 1898 listing 47 species from the Marianas, of which 15 are listed from Saipan, with the title given in my *Fishes of Oceania*.⁴²

⁴⁰ *Holacanthus semicirculatus* (not Cuvier) Fowler and Bean, Bull. U. S. Nat. Mus., no. 100, vol. 8, 1929, p. 186, fig. 9 (upper figure to left).

⁴¹ Proc. Acad. Nat. Sci. Phila., 1945, pp. 59-74, figs. 1-19.

⁴² Mem. B. P. Bishop Mus., vol. 10, 1928, p. 484.

**FIVE NEW SPECIES OF EARWIGS OF THE INDO-PACIFIC GENUS
NESOGASTER (DERMAPTERA: LABIIDAE: NESOGASTRINAE)**

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The genus *Nesogaster* Verhoeff¹ has had twelve species referred to it, these extending in distribution from the Mentawai Islands, west of Sumatra, north to Luzon in the Philippines, south to Tasmania and east to the Samoan, Tonga, and Caroline Islands.

In determining the relationship of a species here described, it was found necessary to assemble all the available representatives of the genus, as a result of which five new species were recognized and are here described. The types of four of these are the property of the Academy, while that of the fifth belongs to the Bernice P. Bishop Museum, of Honolulu. Of this latter species paratypes of both sexes remain in the Academy collection. Of the four new species described from the Academy series three were originally contained in the Hebard Collection, and one was recently received through the kindness of Dr. R. H. Beamer, of the University of Kansas.

***Nesogaster minusculus* new species**

Figs. 1 to 3.

This diminutive species is apparently more nearly related to *N. wallacei* Burr,² of Celebes, *N. tristis* (Bormans),³ of New Caledonia, *N. intermedius* Borelli,⁴ of Borneo, and *N. venustus* Borelli,⁵ of the Kei Islands, than it is to any others of the genus at present known. Borelli's *N. gonopygius*⁶ was described from Siberut Island of the Mentawai Archipelago, but that species, while quite small, differs strikingly from *minusculus* in its subrectangulate male pygidium, its simple and not at all strongly dentate forceps of the same sex, its more longitudinal pronotum, longer elytra and evident wings.

¹ Zool. Anzeiger, XXV, p. 191, (1902). Genotype (by monotypy).—*Nesogaster fruhstorferi* Verhoeff (= *Labia dolicha* Burr, 1897).

² Ann. and Mag. Nat. Hist., (8) I, pp. 44, 45, (1908). [♂; Celebes.]

³ *Labia tristis* Bormans, in Burr, Ann. and Mag. Nat. Hist., (7) XI, p. 240, (1903). [♂; New Caledonia.]

⁴ Journ. Feder. Malay States Mus., XVII, p. 194, fig. 3, (1932). [♂; Kabayau, Mt. Kinabalu, British North Borneo.]

⁵ Treubia, VIII, p. 260, (1926). [♀; Gn. Daab, Kei Islands.]

⁶ Journ. Malayan Branch Royal Asiat. Soc., IV, p. 389, fig. (1926). [♂, ♀; Siberut, Mentawai Islands.]

From *wallacei* the present species differs in the somewhat longer forceps of the male (2.28 instead of 1.5 mm.), which latter bear a marked internal lamellation in their proximal third, culminating in a pronounced tooth, and in the broadly pale external portion of the elytra, which are said to be solidly brownish in *wallacei*. From *tristis* the present species differs in its much smaller size, in the head being pale and the antennae with one article near or at the tip whitish, in the quadrate pronotum, and in the moderately produced and not at all rectangulate pygidium of the male. From the Bornean *intermedius*, which has a somewhat similar male pygidium, the species here described can be distinguished by the quite different development of the male forceps, which in *intermedius* have no marked internal proximal lamellation, and the tooth at the proximal third of that margin is of very different type and set from what is true of *minusculus*. From *venustus* Borelli, of the Kei Islands, known only from the female sex, *minusculus* can be distinguished by the pale lateral sections of the elytra, the piceous pronotal disk and the largely much darker femora of all the limbs. When the male of *venustus* is discovered doubtless numerous other differences will be evident.

In a number of respects this species resembles a miniature of *N. dolichus* Burr, of Celebes, material of which is before me.

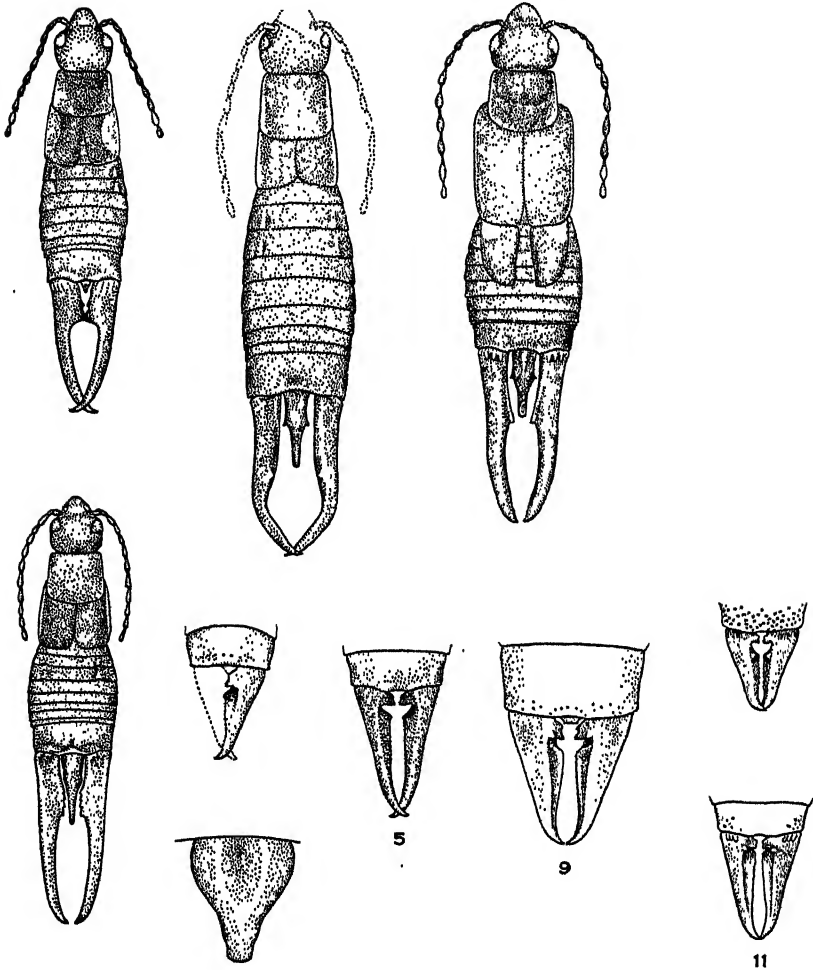
Type.—♂; Laut Tawar, Simalur, Mentawai Islands. August, 1913. (E. Jacobson.) [Academy of Natural Sciences of Philadelphia, Type no. 5721.]

Size small for genus (length of body and forceps, 6.4 mm.); general shape subfusiform, greatest breadth across abdomen, subdepressed; surface polished.

Head cordiform, its greatest length and breadth across the genae subequal, the genae broadly rounded caudo-laterad as seen from dorsum; eyes little prominent, relatively small, hardly longer than half the head length caudad of the eyes; occiput moderately vaulted transversely and longitudinally; antennae with eleven articles, of the type characteristic of the genus, the proximal and third subequal in length.

Pronotum slightly shorter than head, subquadrate, but slightly broader than long, cephalic margin truncate, lateral margins nearly straight but in trend faintly diverging caudad, latero-cephalic angles very narrowly rounded, caudal margin arcuato-truncate with the caudo-lateral angles more rounded than the latero-cephalic ones; surface with transversely rounded disk in breadth narrowing regularly caudad and bearing a well-impressed medio-longitudinal sulcus for three-fifths of its length, this failing to reach either cephalic or caudal margins, lateral subdeplanate bordering areas broad, expanding caudad, in section curving dorsad toward the subcingulate lateral margins.

Elytra mesad subequal in length to the pronotum, rectangulate, their individual breadth equal to three-fourths of their length, humeral margin distinctly carinate, nearly straight as seen from dorsum, narrowly rounding to the transversely truncate distal margin, sutural margin straight. Wings aborted, not evident.



Nesogaster minusculus new species. Male (*type*). Laut Tawar, Simulur. 'Dorsal view, fig. 1 ($\times 10$). Outline of pygidium as seen in dorsal aspect, fig. 2 (greatly enlarged). Female (*allotype*). Same locality. Outline of anal segment and forceps, fig. 3 ($\times 10$).

Nesogaster burri new species. Male (*type*). Mt. Latian, Mindanao, Philippines. Dorsal view, fig. 4 ($\times 6$). Female (*allotype*). Mainit River, Mt. Apo, Mindanao, Philippines. Outline of anal segment and forceps, fig. 5 ($\times 6$).

Nesogaster redivus new species. Male (*type*). Piti, Guam, Marianas. Dorsal view, fig. 6 ($\times 6$). Female (*allotype*). Same locality. Outline of anal segment and forceps, fig. 7 ($\times 6$).

Nesogaster atropos new species. Male (*type*). Hollandia, Dutch New Guinea. Dorsal view, fig. 8 ($\times 10$). Female (*allotype*). Same locality. Outline of anal segment and forceps, fig. 9 ($\times 10$).

Nesogaster apoensis new species. Male (*type*). Mainit River, Mt. Apo, Mindanao, Philippines. Dorsal view, fig. 10 ($\times 6$). Female (*allotype*). Same locality. Outline of anal segment and forceps, fig. 11 ($\times 6$).

Abdomen slightly broader mesad than proximad or distad, lateral folds indicated on third (weakly) and fourth (more strongly) tergites; anal segment transversely rectangulate, its proximal breadth equal to slightly more than twice the median length, lateral outlines subparallel, nearly straight, distal margin moderately cingulate, shallowly but rather broadly concave dorsad of each forcep base and more narrowly so mesad; forceps subequal in length to the abdomen from the distal margin of the elytra to that of the anal segment, moderately incurved in distal two-thirds, that portion unexpanded and with internal face simple and unarmed, the apex moderately acute, immediate base dorsad with a subtransverse ridge of blunt asperities on external half of surface, proximal third of whole with internal lamellation marked, broadening distad to the marked and rather broad trigonal dentiform apex of the lamellation, the proximal half of the internal margin of this area crenulate to a low secondary tooth, from which to the main tooth the margin is simple; pygidium relatively short (for genus), in length but little more than one-fifth of the forceps, carried subvertically, its proximal section subquadrate with a blunt-tipped digitiform distal section which has its lateral margins subconcave; subgenital plate moderately transverse, lateral and distal margins broadly arcuate with a slightly indicated and very shallow median emargination.

Femora relatively short and robust as usual in the genus, bulbosely fusiform, more slender distad; tibiae fusiform in profile, more tapering proximad, definitely compressed; tarsi as usual in the genus.

Allotype.—♀; same data as type. [Academy of Natural Sciences of Philadelphia.]

Differing from the above description of the type in the following noteworthy respects.

Slightly longer and slightly more robust than male, general form and proportions similar.

Head, pronotum and elytra as in male. Wings equally aborted.

Abdomen slightly more tumid mesad than in male, lateral folds as in latter; anal segment transverse, subrectangulate, somewhat narrowing distad, the greatest proximal breadth equal to about half the median length, structure of distal margin similar to that of male but less strongly developed, scattered minute asperities present on the dorsal surface near the forcep bases and more sparsely so between the same; forceps moderately stout, in length faintly less than the proximal breadth of the anal segment, in distal three-fourths tapering with apex moderately recurved, proximo-dorsal lobe, which is characteristic of the females of this genus, marked but somewhat narrowing to its bluntly subtruncate apex, equally characteristic post-lobal excision marked and subcircular but with the margin at depth of excision briefly crenato-lobulate, internal (sectorial) margin of forceps finely crenulate, ventral surface of forceps subdeplanate; pygidium carried vertically, longitudinally subrectangulate, lateral margins somewhat expanding distad, apex subtruncate; subgenital plate transverse, median length equal to approximately half of proximal breadth, distal margin broad obtuse-angulate with immediate apex rounded.

Coloration.—Head xanthine orange (of Ridgway), eyes bister, antennae with three proximal articles xanthine orange, thence passing to prout's

brown with the preapical (or in the allotype on one antenna alone the apical) article cream color. Pronotum with disk mummy brown, the lateral areas translucent tawny-olive; elytra with sutural half mummy brown with external section translucent tawny-olive, the dividing line concave externally and reaching the margin distad at the disto-lateral angle. Abdomen mahogany red, darkening to liver brown laterad, forceps mahogany red, pygidium liver brown in male, mahogany red in female. Femora mummy brown with a narrow distal section and all of the tibiae and tarsi tawny-olive.

Length of body (exclusive of forceps), ♂, 4.4 mm.; ♀, 4.7: length of pronotum ♂, .75; ♀, .90: length of elytron distad of pronotum, ♂, .75; ♀, .80: length of forceps, ♂, 2; ♀, 1.5.

This species is known only from the type and allotype.

Nesogaster burri⁷ new species

Figs. 4 and 5.

This species, *reditus* and *apoensis*, all here described, have a basic similarity in that the pygidium of the male is greatly elongate and developed into a slender lanceolate structure nearly or quite half as long as the forceps. Of the previously known species but one—*aculeatus* (Bormans), from British New Guinea (i. e., Papua)⁸—has a comparable structure, but in that species the form of the male pygidium is more definitely elongate trigonal, “en aiguillon triangulaire étroit” as its describer says. In the three species here described the pygidial form in the male is not at all triangular, and they need comparison chiefly with one another.

When the present species is compared with the description of *aculeatus* the former is seen to differ in its unicolorous antennae and femora, in the proximal abdominal tergite not being conspicuously and contrastingly pale, in the male pygidium being slender, subequal in breadth in proximal half and slender digitiform in distal half with each lateral border mesad bearing a minute spiniform tooth, and in the male forceps lacking a median tooth and being hardly at all dilated on internal face of the proximal half. When compared with two females of *aculeatus*, determined and so labelled by Burr, now before me,⁹ the pronotum of *burri* is seen to be more nearly quadrate, faintly widening caudad with the lateral margins straighter and the angles much more narrowly rounded, while the head and pronotum are both definitely larger and more robust in *burri* than in *aculeatus*, also the arms of the forceps in that sex are somewhat more elongate, with the proximal lobe heavier and the diastema, which is so characteristic of females of this genus, deeper and more decided. When compared with *N. reditus*, here

⁷ In tribute to the work of my long-time friend Dr. Malcolm Burr, who gave us the fundamental background, and a very large part of the detailed study, on which our present knowledge of the Dermoptera has been based.

⁸ *Labia aculeata* Bormans, Annali Mus. Civ. Stor. Nat. Genova, ser. 2, XX, p. 456, (1900). [♂, ♀; British New Guinea (=Papua).]

⁹ Ins. Buru; (H. Kühne); 2 ♀; [A.N.S.P.].

described, *burri* is of larger size in both sexes, has a generally similar but less attenuate male pygidium, has more arcuate and less elongate male forceps, which also lack any definite internal lamellation proximad, while the female forceps are much less robust and more elongate, the pronotum in both sexes also being quadrate and not transverse, as is the case with *reditus*. In *burri* the antennal articles are also definitely more elongate and less bead-like than in *reditus*, while in this respect *aculeatus* stands between the two new species.

Comparison of *N. burri* with *N. atropos*, here described, has been made under the latter species on a following page.

Type.—♂; Mt. Latian, Davao-Cotabato Provinces, Mindanao, Philippines. Elevation 5800 ft. July 4, 1930. (C. F. Clegg.) [Academy of Natural Sciences of Philadelphia, Type no. 5722.]

Size relatively large for genus (length of body and forceps, 11.6 mm.); general shape more attenuate and less fusiform than in *minusculus*, while broadest across abdomen, width is there definitely less than one-third of body length exclusive of forceps, subdepressed; surface moderately polished, of elytra and abdominal tergites, but obsoletely on anal segment, microscopically impresso-punctulate.

Head partly damaged in type.

Pronotum quadrate in outline, caudal breadth and median length subequal, the latter faintly greater than the humeral length of the elytra, lateral margins of pronotum nearly straight, very slightly diverging caudad, laterocephalic angles very narrowly rounded, caudo-lateral angles more broadly so, caudal margin subtruncate; surface with the transversely low arcuate disk faintly narrowed mesad and broadening somewhat caudad, with a very faint medio-longitudinal impression failing to reach cephalic or caudal margins, lateral sections of surface relatively narrow, broadest mesad, attenuate and sharply defined cephalad, more arcuately narrowed but less clearly delimited caudad, external flange definitely ascending dorso-laterad.

Elytra quite short, their exposed humeral length slightly less than the median length of pronotum, the former (i.e. external length) equal to slightly more than 1.5 times the breadth of a single elytron, external (humeral) and sutural margins straight and subparallel as seen from dorsum, latter margin no longer than the breadth of a single elytron, distal margin moderately oblique truncate, disto-lateral and disto-sutural angles each very narrowly rounded; humeral ridge strongly carinate and elevated as seen from dorsum, lateral section of elytra moderately broad, arcuately narrowing in depth distad, the whole definitely inflexed ventro-mesad.

Abdomen moderately narrowing proximad, its breadth mesad and distad subequal, approximately 1.5 times that of pronotum, the lateral margins in those sections roughly subparallel, lateral folds indicated on third (briefly distad) and fourth (more broadly) tergites; anal segment transversely subrectangulate, its proximal breadth equal to 1.7 times the median length, lateral margins straight, subparallel, distal margin very shallowly and broadly concave over each forceps base and over that of the pygidium, moderately cingulate between the former, where the adjacent surface is shallowly impressed with a median very short but marked impressed medio-longitudinal sulcus; forceps subequal in length to that of the abdomen from

the apices of the elytra to the base of the anal segment, subparallel in proximal half, moderately bent arcuate briefly distad of middle and thence nearly straight oblique converging to the very slightly hooked apices, which in normal position briefly cross, in breadth the forceps arms taper but slightly in the proximal two-thirds of the straight portion, thence regularly and appreciably narrow to the bend, from which point they are subequal in breadth to the briefly acute apices, the breadth of the oblique distal section being approximately one-half that of the broader proximal portion, internal margin smooth and unarmed except for a series of fine denticulations along the ventro-internal margin of the broader proximal section; transversely at immediate base the dorsal surface bears laterad a group of subdentiform tubercles; pygidium elongate, almost equal to half the length of the forceps, proximal half subequal in breadth to the proximal half of the forceps, this very faintly narrowing distad, with the lateral margins bearing on each side a brief but marked obliquely directed tooth, distad of which the pygidium is styliformly narrowed, its lateral margins concavely converging to distal fourth and thence parallel to the narrowly rounded apex, the breadth of the styliform portion of the pygidium at distal fourth of whole not more than one-third of proximal pygidial breadth; subgenital plate transverse, median length but half of proximal breadth, distal margin arcuate laterad with a very shallow and broad angulate median emargination.

Femora as a whole proportionately more slender than in *minusculus*, but possessing the usual bulbous characteristics of the genus, the cephalic shorter and proportionately stouter than the others; tibiae of the compressed type usual in the genus; caudal metatarsi half as long as the caudal tibiae.

Allotype.—♀; Mainit River, Mt. Apo, Davao-Cotabato Provinces, Mindanao, Philippines. Elevation, 7000 feet. September 15, 1930. (C. F. Clegg.) [Academy of Natural Sciences of Philadelphia.]

Differing from the above description of the type in the following noteworthy respects.

Size relatively the same as in male; form, particularly of abdomen, more robust; surface punctulae subobsolete.

Head cordiform in outline, faintly deeper than broad, caudal occipital outline very shallowly emarginate, caudo-lateral section of head outline broadly rounded; occiput with surface relatively full and rounded, both transversely and longitudinally; eyes of medium size, little prominent, their length subequal to that of postocular portion of genae; antennae with thirteen articles, third article slightly shorter than proximal.

Pronotum similar to that of male but slightly more transverse, caudal margin faintly more arcuate.

Elytra as in male but humeral length faintly greater than the median length of the pronotum and equal to 1.6 times the breadth of a single elytron, distal margin less strongly oblique.

Abdomen with its breadth mesad slightly greater than that distad, and 1.5 times that proximad and also of pronotal breadth, lateral folds as in male; anal segment transverse with median length not quite half the proximal breadth, lateral margins nearly parallel, faintly converging distad, distal margin truncate, hardly at all cingulate, surface meso-distad shallowly impressed with a proportionately more proximal and much more weakly

indicated medio-longitudinal subsulcation; forceps not over four-fifths as long as abdomen to base of anal segment, of the type general in females of the genus but more slender and attenuate, evenly tapering to apex in distal four-fifths, apices gently incurved and crossing, but only the weakest indication of surface proximo-dorsal asperities present, proximo-dorsal lobe marked with several rounded marginal nodes, post-lobe excision pronounced but subtrigonal in outline with margin smooth, internal margin distad of excision with a low proximal dentiform node followed by a subobsolete crenulation, ventral surface deplanate, in profile the forceps are appreciably curved dorso-distad; pygidium carried vertically, relatively narrow, elongate rectangulate, distal width of pygidium slightly less than half its length, lateral margins faintly convergent distad, apex subtruncate, surface in proximal third with a medio-longitudinal impression, at distal third a transverse surface swelling terminates on each side in a distinct spiniform tooth, which is directed dorso-laterad; subgenital plate transverse, median length but half of proximal breadth, distal margin rounded subtrigonal with apex broadly rounded.

Coloration.—Dorsal surface mummy brown, lightening slightly to prout's brown to russet on the middle of abdomen and proximal portion of anal segment, except for the dull honey yellow lateral sections of pronotum the head, pronotum and elytra are unicolorous. Antennae solidly of the general color (complete only in female). Forceps and pygidium of male hazel, of female hay's russet with apical margin of proximo-dorsal lobes infuscate with mummy brown. Ventral surface of male hazel, paling cephalad to ochraceous-tawny on prosternum; ventral surface of female orange-cinnamon, paling cephalad to pale isabelline on prosternum. Limbs tawny-olive to sayal brown, unicolorous.

Length of body (exclusive of forceps), ♂, 8.1 mm.; ♀, 9.1: length of pronotum, ♂, 1.4; ♀, 1.6: length of elytron distad of pronotum, ♂, 1.1; ♀, 1.3: length of forceps, ♂, 3.5; ♀, 2.9.

I know solely the type and allotype of this species.

Nesogaster redivus new species

Figs. 6 and 7.

As explained under *N. burri*, that species, the present one, *N. apoensis*, described on a following page, and *N. aculeatus* (Bormans) basically agree in the elongate slender type of male pygidium. Under *burri* comparison is made with *redivus*, and *apoensis* is contrasted with *redivus* in its diagnosis. From *aculeatus* this species differs, as does *burri*, in the shorter, more robust articles of the antennae and the general form of the male pygidium, in the broader and somewhat transverse pronotum, the narrower elytra, in the lamellate interno-proximal border of the male forceps lacking a pronounced tooth at its distal extremity, while the forceps of the female are proportionately shorter and more robust than in *aculeatus*. Comparison with *N. atropos*, here described, is made under that species on a following page.

Type.—♂; Piti, Guam, Marianas Islands. August 19, 1936. (O. H. Swezey, ex rotten bamboo sprouts.) [Bernice P. Bishop Museum.]

Size medium (for genus); build subfusiform with abdomen moderately narrowed proximad; surface polished, of abdominal dorsum and subgenital plate, and less definitely of anal segment, micro-punctulate.

Head in outline cordiform, its length and breadth across eyes subequal, occipital outline subobsoletely emarginate, postocular angles of genae broadly rounded as seen from dorsum; eyes moderately prominent, in length subequal to that of postocular portion of genae; surface of occiput in outline appreciably arcuate both longitudinally and transversely; antennae of type with twelve articles,¹⁰ of the type characteristic of the genus, proximal article slightly longer than third.

Pronotum subquadrate, slightly broader caudad than long, its cephalic breadth subequal to that across eyes, lateral margins nearly straight, slightly diverging caudad, caudal margin subarcuate, latero-cephalic angles very narrowly rounded, caudo-lateral angles much more broadly rounded; surface of disk with a sharply indicated and subincised medio-longitudinal impression, while a transverse broader and less sulciform depression crosses the disk at approximately its middle, lateral areas appreciably ascending dorso-laterad.

Elytra with greatest length caudad of the pronotum slightly greater than that of pronotum (as 23 to 21) their length equal to 1.3 times the greatest breadth of a single elytron, carinate external margin of elytral disk definitely cingulate, as seen from dorsum arcuato-truncate mesad, more definitely arcuate proximad and distad, apical margin subtruncate, slightly oblique, latero-caudal angle moderately rounded. Wings not evident.

Abdomen moderately broadening from narrowed base to middle, thence subequal in breadth to anal segment; lateral folds indicated on third and fourth (much the stronger) tergites; anal segment rectangulately transverse, its proximal breadth equal to 2.4 times the median length, lateral margins straight and subparallel, distal margin sinuate, with a shallow concavity dorsad of the base of each forceps arm and a much broader, more evenly and deeply concave one mesad above the pygidial base, this margin strongly cingulate, particularly mesad, surface with a very short but deeply incised medio-longitudinal depression briefly cephalad of the distal margin, flanked laterad by poorly defined transversely disposed areas of slightly elevated surface sculpture, these narrowing mesad and joining distad of the median impression; forceps twice as long as the abdomen to the base of the anal segment (as 11 to 5.5), relatively straight to the distal third, where they slightly incline to the very briefly and faintly incurved apices, proximal four-elevenths subdepressed, with a sublamellate internal flange, the dorsal margin of which is coarsely serrato-dentate, while a ventral margin on the proximal half of this section juxta-pygidially is finely serrulate, distal seven-elevenths of forceps rounded in cross-section, internal surface somewhat flattened and not at all lamellate, immediately proximal section of dorsal surface shallowly excavate with a basal series of transversely disposed low but distinct asperities, ventral surface subdeplanate; pygidium elongate, hastate, proximal breadth subequal to one-third the pygidial length, latter equal to approximately half that of forceps, tapering throughout, at third

¹⁰ Apparently fifteen is the maximum number ever present, but the majority of the adult specimens seen have fewer, occasionally as few as eleven being found. This condition has been discussed more fully under variation at the end of the description.

of length lateral margins bear a single short spiniform tooth, distad of which the whole pygidium is acuminate styliform to the narrowly rounded apex, in profile the dorsal outline of the pygidium is somewhat concave in proximal third and also very briefly so distad, nearly straight mesad, ventral margin subdeplanate in profile except for a brief distal upcurving; subgenital plate transverse, median exposed length equal to half of proximal breadth, distal margin broadly arcuate with a very shallow and slight concavity mesad.

Femora robust and inflated, caudal and median pairs less so than the cephalic, general form as usual in the genus, cephalic pair slightly shorter than the pronotum; caudal tibiae slightly shorter than the femora (as 3.5 to 4), appreciably compressed; caudal tarsi with metatarsus slightly longer than other articles combined.

Allotype.—♀; same locality and collector as type. October 27, 1936. (In rotten board on ground.) [Bernice P. Bishop Museum.]

Differing from the above description of the male in the following noteworthy features.

Form more stocky than in male sex, the shorter forceps giving to the whole a more truly fusiform outline; surface of anal segment with the micro-punctulae of the abdominal tergites replaced by numerous elevated tuberculiform asperities.

Antennae of female with 12 or 13 articles.

Pronotum and elytra as described for male. Wings not evident.

Abdomen more appreciably narrowing distad than in male, abdominal outline, as viewed from dorsum, consequently more bottle-shaped, abdominal folds as in male; anal segment transversely rectangulate but somewhat narrower than in male, the median length contained but 2.3 times in proximal breadth, lateral margins faintly concave, distal margin shallowly arcuate with a median subtruncation, essentially as in male but median incision less deeply cut and the surface asperities quite marked, particularly evident and larger in size and more numerous in a subtransverse series dorsad of the base of the arm of each forceps; forceps hardly longer than the breadth of the anal segment, of the type usual in the female sex of the genus but quite stout and strongly tapering, proximal breadth of a single arm equal to one-third length of same, in cross-section triquetrous, immediate apices moderately incurved, acute and overlapping, proximo-dorsal lobe relatively pronounced, its distal margin shallowly binodose, post-lobe excision strongly marked, rounded in outline so that when the forceps are apposed the combined excision outline is cordiform with the apex distad, ventro-internal margin distad of the excision serrulate but this becomes progressively obsolete distad, internal surface briefly dorsad of proximal point of serrulate margin with a distinct but low node, dorso-internal margin distinct but unarmed; pygidium essentially as described for the female sex of *N. burri* with a similar proximal sulcation and distal paired teeth, apposed to each of which on the adjacent internal surface of the forceps is a similar spiniform tooth; subgenital plate transversely broad subtrigonal with the apex rounded.

Coloration.—General tone except for antennae, lateral sections of pronotum, two proximal abdominal tergites, forceps, pygidium, extremities of femora, all of tibiae and tarsi and ventral surface, mummy brown to

blackish fuscous, occasionally the meso-dorsal portion of certain abdominal tergites paling somewhat to russet. Antennae with three proximal articles and a single one distad (which may be the apical or preapical one¹¹) raw sienna to ochraceous-buff, remainder dresden brown to mummy brown. Lateral sections of pronotum, pale dorsal base of abdomen and pale portions of all limbs ranging from ochraceous-buff to pale ochraceous-buff (of Ridgway). Forceps and pygidium of male ochraceous-orange to orange-rufous, the latter area sometimes infumate in proximal section; of female hay's russet to liver brown, the apex of the proximal lobe of the forceps infusate. Ventral surface of sterna and proximal section of abdomen varying from quite pale—as light as ochraceous-buff—to quite heavily infusate, median and distal portions of venter of abdomen and subgenital plate definitely more infumate than the proximal section, venter of forceps of both sexes and of pygidium of male colored as the dorsum of same.

Measurements.—This species varies greatly in size, and particularly in the male sex, in material from the same immediate locality, as the following measurements (in millimeters) of adults, selected to show size range, will demonstrate:

	Length of body (ex- clusive of forceps or pygidium)	Length of pronotum	Length of elytron	Length of forceps	Length of male pygidium
♂, Yigo, Guam, <i>paratype</i>	4.5 ¹²	1.0	1.0	3.15	1.35
♂, Piti, Guam, <i>type</i>	5.9	1.15	1.1	3.95	1.7
♂, Piti, Guam, <i>paratype</i>	4.9	.95	.85	2.45	.95
♀, Machanao, Guam, <i>paratype</i>	5.3 ¹²	1.1	.95	1.5	..
♀, Yigo, Guam, <i>paratype</i>	7.0	1.0	1.25	1.75	..
♀, Yigo, Guam, <i>paratype</i>	6.25	1.1	1.2	1.65	..
♀, Agana, Guam, <i>paratype</i> ...	5.3	1.1	1.15	1.65	..
♀, Agana, Guam, <i>paratype</i> ...	6.1	1.1	1.15	1.75	..
♀, Piti, Guam, <i>paratype</i>	4.45	.95	.9	1.35	..
♀, Piti, Guam, <i>allotype</i>	5.6	1.	1.05	1.6	..
♀, Piti, Guam, <i>paratype</i>	6.5	1.2	1.15	1.9	..
♀, Mt. Alifan, Guam, <i>paratype</i>	5.5	1.05	1.10	1.6	..
♀, Fadian, Guam, <i>paratype</i> ...	4.85	.95	1.05	1.5 ¹³	..
♀, Fadian, Guam, <i>paratype</i> ...	7.0	1.2	1.25	1.75	..

Variation.—The individual range in size in this species is set forth in the above table, and the range in color tone has been brought out in the color description. While the forceps of the female sex are, as usual, quite stable in size and character, those of the male show very marked variation in length in the sole series in which a small representation of that sex is included, i. e. that from Piti. In all the adult males seen (5), however, they vary only in the length, and the character of development is the same in all

¹¹ In antennae which apparently are entire there seems to be no rule as to which distal article is the pale one. See comments under "Variation."

¹² Abdomen exceptionally retracted.

¹³ The forceps in this individual are somewhat distorted, the distal portion of the left arm being aborted and twisted, but the right arm, which is the one measured, is normal in length although marginally atypical.

with the relative proportions of the two structural sections of the forceps remaining constant. Also, the variation in the length of the male pygidium, as far as evidenced by this limited series of males, maintains a fairly approximate ratio with the length of that section of the forceps which has an internal flange, the diminution of pygidial length, however, not affecting the length of the broader basal section of the pygidium, but solely that of the distal styliform extremity. In the minimum-sized male from Piti the stylate portion of the pygidium is so reduced it occupies no more than half the entire pygidial length. The usual ratio, however, has the attenuate distal extremity longer than the basal section, although the type is the sole individual seen with the pygidium as attenuate and the styliform section as elongate.

The number of antennal articles in apparently complete antennae ranges from eleven to fifteen, and there definitely appears to be an occasional difference in the number in paired antennae. Males range from eleven to fifteen, females from eleven to fourteen in number of articles. One male and five females show an apparent difference of one in number of articles, and one male and two females show a difference of two in the same. A check of the position of the usual pale distal article on the antennae shows that in the male sex it is terminal in three individual antennae (two in one individual), next to last in the two of one individual, and absent from one antenna in another case. In the female sex it is terminal in six antennae (but two paired in a single individual), next to last in eleven antennae (eight paired in four individuals), and absent from three antennae. These figures have been drawn solely from adults and from their antennae which are considered complete and perfect.

Remarks.—This species is known only from the island of Guam in the Marianas. The material examined and listed below was secured by the entomological survey of Guam conducted in 1936 for the Bernice P. Bishop Museum, in the collection of which and of the Academy of Natural Sciences of Philadelphia the below-listed series of this species will be found. All adult specimens additional to the type and allotype are considered paratypes.

Specimens examined: 30; 5 ♂, 17 ♀, 8 juvs.

GUAM: Machanao; VI, 4, 1936; (O. H. Swezey; "under bark"); 1 ♀. Vigo; X, 18 and XI, 13, 1936; (O. H. Swezey; "ex dead small leaf ficus" and "ex rotten banana stem"); 1 ♂, 2 ♀. Dedado; IX, 7, 1936; (O. H. Swezey; "under bark"); 1 ♀, 1 juv. Agana; V, 25, 1936; (O. H. Swezey; three labelled "ex coconut log"); 3 ♀, 2 juvs. Piti; VIII, 19, IX, 6, X, 6 and 27, XI, 3, 1936; (O. H. Swezey; "ex rotten bamboo sprouts", "under bark", "in rotten wood", "in rotten board on ground" and "in garden"); 4 ♂ (including *type*), 7 ♀ (including *allotype*). Mt. Alifan; V, 26, 1936;

(O. H. Swezey; "ex papaya log" and "ex rotten banana stem"); 1 ♀, 4 juvs. Fadian; IX, 18, 1936; (O. H. Swezey; "in rotten log"); 2 ♀, 1 juv.

*Nesogaster atropos*¹⁴ new species

Figs. 8 and 9.

Of the previously known species this new one is more nearly related to *N. amoenus* (Stål) and *N. intermedius* Borelli than any others. From *amoenus* (Stål),¹⁵ with both sexes of which from Sumatra (♂ from Fort de Kock and Mt. Ophir, ♀ from Mt. Sago) *atropos* has been compared, the latter differs in the narrower lateral sections (laterad of disk) of the pronotum, the uniformly colored elytra, the fewer pale proximal articles of the antenna (not more than three so colored), the much more elongate and attenuate pygidium of the male, and the greatly reduced and in position median tooth on the internal surface of the male forceps, while in addition in the female sex the forceps are shorter and stouter. From the description of Borelli's *intermedius*¹⁶ the new species can be distinguished by the much more elongate linguiform male pygidium, which is almost half as long as the forceps, the median position of the tooth in the internal face of the forceps, the unicolorous elytra, and the uniformly pale tibiae.

This species has the male pygidial structure very similar to what is found in *N. burri* and *reditus*, here described, but *atropos* can at once be separated from both of these by the uniform breadth of the pronotum, which does not expand caudad, as well as the subequal dimensions of the same, while the male forceps have a distinct internal median tooth, lacking in *N. burri*, and the crenulation of the internal margin of the proximal half of the male forceps is very different from what is found in *N. reditus*. In the female sex *atropos* is much nearer *N. reditus* than it is to *N. burri*, having its forceps of similar build, although the post-nodal notch is narrower and less open. The forceps of the female of *atropos* are definitely shorter, less attenuate and stouter than in *burri*. The pronotal differences noted above are also as marked in the females as in the males.

Type.—♂; Hollandia, north coast of Dutch New Guinea. April 12, 1945. (H. Hoogstraal; "in rain forest".) [Academy of Natural Sciences of Philadelphia, Type no. 5743.]

Size medium (for genus); general build subfusiform; surface relatively polished.

Head cordiform, very slightly longer than breadth across eyes (as 23 to 20.5), occipital outline shallowly concave mesad, outline of postocular genae as seen from dorsum broadly rounding to occipital base, genal length, in

¹⁴ I. e. *Atropos*, one of the Fates.

¹⁵ (*Forficula*) *amoena* Stål, Öfvers. Kongl. Vet.-Akad. Förhandl., XII, p. 350, (1855). [♀; Java.]

¹⁶ Journ. Feder. Malay States Mus., XVII, p. 194, fig. 3, (1932). [♂; Kabayau, 600 feet, Kinabalu region, North Borneo.]

same view, slightly less than eye length, surface of occiput broadly arcuate transversely and longitudinally; antennae subequal in length to that of pronotum, elytra and wings combined, of the structural form characteristic of *Nesogaster*, consisting of 12 to 13 articles,¹⁷ proximal article slightly longer than third (as 6 to 5).

Pronotum subquadrate, slightly broader than long (as 20 to 17), the broadest point at two-thirds of length, lateral margins subarcuate, weakly expanding caudad to point of greatest breadth, then broadly rounding to the distinctly arcuate caudal margin, latero-cephalic angles narrowly rounded subobtusely; surface with cephalic half of disk moderately tumid, very appreciably convex, arcuately delimited caudad from the much more restricted caudal section of disk, which in breadth occupies much less than half the pronotal width, is moderately concave, narrows caudad and bears in its more cephalic section a subobsolete and ill-defined medio-longitudinal sulcus, lateral areas of moderate breadth cephalad and there sharply up-flaring dorso-laterad, then broadly encompassing the caudo-lateral periphery of the cephalic half of the disk and in caudal half of whole surface extending as broad subconcave areas to the poorly defined borders of the caudal half of the disk.

Elytra with their greatest exposed length (along humeral outline) nearly twice that of pronotum (as 32 to 17), from caudal margin of pronotum the length is approximately 1.5 times as long as pronotum (as 25 to 17), elytral breadth contained 1.3 times in the latter length (as 13 to 17), latero-cephalic angle broadly rounded, humeral ridge cingulately carinate, that margin as seen from dorsum nearly straight, sutural margin straight, distal margin transversely truncate; lateral area quite broad, inflexed, in breadth regularly and arcuately narrowing distad. Exposed portion of wings equal in length to half of the greatest elytral length, apex sharply truncate and in breadth but slightly less than one-half the proximal exposed alar width.

Abdomen somewhat bottle-shaped, narrowing more distinctly proximad than distad, lateral folds weakly (on third tergite) or distinctly (fourth tergite) marked; anal segment quite strongly transverse rectangular, the greatest proximal breadth being three times the median length, lateral margins straight and subparallel, distal margin appreciably triundulate, being shallowly concave dorsad of the base of each forcep arm and more deeply so dorsad of the pygidium, median section of margin distinctly cingulate, surface of the dorsum adjacent to this area appreciably but narrowly transverse excavate; forceps slightly longer than the pronotum and elytra combined, a portion slightly less than proximal half subtriquetrous in cross-section, with a dorso-internal lamellato-carinate rim, which is unarmed but terminates in a distinct meso-caudad directed rather short tooth, ventrad of this, about half as long and apparently engaging the lateral tooth on the pygidium, is a series of serratulo-denticulations, distad of the median tooth the forceps are more slender, moderately incurving to the weakly hooked apices, with their ventro-internal surfaces subdeplanate and their ventro-internal margin sparsely subcrenulate, dorsal surface with a short low longitudinal subcarination close to the dorso-internal margin, laterad of this the surface is briefly and rather shallowly subexcavate, at the

¹⁷ See remarks at end of description relative to variation in number of antennal articles.

extreme base with a minute series of three transversely placed but longitudinally disposed carinulations, between which are scar-like impressed areas; pygidium elongate, its length equal to 2.3 times its proximal breadth, the apex reaching to the median tooth of the forceps, its broader portion occupying but slightly less than half of the pygidial length, its lateral margins slightly converging distad, unarmed but with a distinct lateral spiniform tooth where they pass to the definitely styliiform distal half of pygidium; which section has its lateral margins strongly converging distad for basal two-fifths of the length of the area, thence subparallel to the well-rounded apex of this linguiform extremity, dorsal surface of pygidium proximad strongly arcuate transversely, this increasing regularly in emphasis proximad, distal extremity with a median surface concavity briefly preceding the apex; subgenital plate transverse, its exposed median length equal to slightly less than half of proximal breadth, distal margin obtuse-angulate with immediate apex rounded.

Limbs of the type characteristic of *Nesogaster*, the femoral inflation and the tibial compression marked; caudal metatarsus slightly longer than remaining caudal tarsal articles combined.

Allotype.—♀; same data as type. [Academy of Natural Sciences of Philadelphia.]

Differing from the description of the male sex (type) in the following note-worthy features.

Pronotum more nearly quadrate than in male, the breadth but very faintly greater than length (as 22 to 21), caudal rounding of lateral margins to the caudal one narrower and less sweeping, caudal margin with arcuation somewhat flattened mesad; separation of surface sculpture of disk into two sections less definite but general outline of elevated disk similar.

Elytra with their humeral length subequal to 1.6 times the pronotal length (as 35 to 21), from the caudal margin of pronotum the length is nearly 1.3 times that of pronotum (as 27 to 21), elytral breadth contained nearly 1.25 times in the latter length (as 17 to 21).

Abdomen stouter than in the male; anal segment transverse rectangulate, but less strongly so than in male, the exposed median length being contained approximately 2.2 times in the proximal breadth, lateral margins weakly arcuate convergent distad, the distal breadth of plate being ten-elevenths of that proximad (as 30 to 33), distal margin as a whole subtruncate, surface distad with a number of scattered minute asperities, which are grouped chiefly on a pair of low rounded surface swellings placed dorsad of the forceps bases and in a semilunate series internally bordering the median section of the distal margin, cephalad of which latter series the surface is moderately impressed in a narrow transverse W-shaped fashion, on the sections decurving laterad the anal segment has its surface finely shagreenous, this accompanied near the forceps base by a subarcuate transverse impression which becomes obsolete dorsad; forceps of the type usual in the genus, subequal in length to the distal breadth of the anal segment, stout, strongly tapering, proximal breadth of a single arm (including proximo-dorsal lobe) equal to four-tenths of the length of the same, in cross-section strongly triquetrous, immediate apices incurved, acute, slightly overlapping, proximo-dorsal lobe pronounced, its apical margin shallowly binodose, post-lobal

excision strongly marked, the excision shorter than, but equally as deep, as in *N. redivus*, its outline less rounded and somewhat squarer, ventro-internal margin distad of excision minutely serrulate, this becoming obsolete toward apex, internal surface with a node in the same position as that described under the female sex of *redivus*, but that structure is lower and less evident, dorso-internal margin unarmed; pygidium much as described for the female sexes of *N. burri* and *redivus* but distal transverse elevated structure higher and sharper, more definitely transverse tectate, the single tooth on each side marked but small, and the ventral surface proximad of this area is subshagreenous; subgenital plate transversely trigonal, the median length subequal to half the proximal breadth, apex moderately rounded.

Coloration.—Base color mummy brown to blackish fuscous, involving most of the pronotum, all of the elytra, the greater portion of the exposed section of the wings, in the female virtually the entire abdomen and in the male the proximal section of the same and most of the anal segment. Head either solidly of the dark body color or pale zinc orange to tawny; antennae with the three proximal articles ranging from ochraceous-buff to zinc orange, the remainder of the antennae ranging from buckthorn brown to mummy brown, with one to two preapical articles cream colored; eyes fuscous. Pronotum with lateral borders narrowly yellow ocher of varying tonal depth. Exposed portion of wings with a proximal spot on external two-thirds of its breadth antimony yellow. Abdomen of male with that section between the dark proximal portion and the anal segment paling to orange-rufous or burnt sienna; forceps and pygidium of male pale orange proximad, darkening distad on forceps to orange-rufous or burnt sienna, forceps and pygidium of female but slightly paler than the general body infuscation; ventral surface of abdomen, subgenital plate, forceps and pygidium of male dull orange rufous, of female darker and nearer auburn. Limbs with the bicoloration noted in other species, the dark portions of the femora being of the general body color, the pale sections, tibiae and tarsi cream-colored.

The two types of head coloration are quite distinct and show no intermediate conditions. Both occur in males and females, and there is no correlation of one or the other with different colorational or other features. The number of pale distal antennal articles ranges individually from one to two on the antennae of the same individual (a female paratype from Hollandia), and in the type, which has the preapical one solidly pale, the distal article is pale but partially clouded, a condition seen in no other specimen.

Measurements in millimeters

	Length of body (ex- clusive of forceps)	Length of pronotum	Length of elytron	Length of forceps	Length of male pygidium
♂, Hollandia, New Guinea, type.....	4.5	.95	1.5	2.3	1.0
♀, Hollandia, New Guinea, allotype.....	6.0	1.05	1.75	1.4	..
♀, Mt. Lamington, Terr. of Papua, New Guinea, paratype.....	5.3	1.0	1.75	1.45	

Variation.—The individual size range in this species does not seem to be extensive, but as all except one of the specimens of the species examined have been dried from alcohol, it is difficult to evaluate properly such general size discrepancies as may be noticed in these individuals. However, as individual parts show almost no size difference I am presuming abdominal dilation is responsible for what little bulk range is noticed.

The number of antennal articles ranges from twelve to fourteen, with usually the same number present in both antennae of the same individual, although one has twelve in one and thirteen in the other, and two have thirteen in one and fourteen in the other. The distal pale articles are usually two in number, but may be only one, and while the penultimate article is always involved, the other, when two are so colored, is usually the antepenultimate, although in two cases this is replaced by the apical. There is no sex correlation of the number of articles present or of those pale colored, nor is there any association of groupings with the type of head coloration. One male with an apparently regenerated antenna has but eight articles there present, but in this the penultimate and antepenultimate are pale, as in its normally developed mate.

The two types of head coloration show no sex correlation, and the presence of both in a single species casts some doubt on the value of this coloration as a specific feature in the genus, as has been assumed in the past.

Remarks.—This species is apparently rather widely distributed in New Guinea, as it is before me from two localities along the north coast which are separated by an air-line distance of over six hundred miles. All of the material seen additional to the type and allotype is considered to be paratype.

Specimens examined: 10; 4 ♂, 6 ♀.

DUTCH NEW GUINEA: Hollandia; IV 12, 1945; (H. Hoogstraal; "in rain forest"); 4 ♂, 5 ♀, *type* and *paratypes*; [A.N.S.P.].

PAPUA: Mt. Lamington, Northern Division; VII, 23-24, 1927; (C. T. McNamara); 1 ♀, *paratype*; [A.N.S.P.].

*Nesogaster apoensis*¹⁸ new species

Figs. 10 and 11.

Contrasted with *N. aculeatus* (Bormans) and the four preceding new species here described, *N. apoensis* can be separated at once in the male sex by the form of the forceps, which strongly suggest those of numerous species of the genus *Forficula*, in that there is present in the proximal half a marked internal lamellation without pronounced marginal teeth but with a distal dentiform lobule, distad of which the rami are moderately incurved. The male pygidium is very elongate and slender, more attenuate than in any of the related species, its margins non-denticulate, while the antennae are more

¹⁸ From Mt. Apo, the highest mountain in Mindanao, from the slopes of which came the material on which this species is based.

slender than in *reditus*, but less so than in *burri*. The pronotal form is nearer that of *burri* than it is that of *reditus*, as is also true of the elytra, which, however, are shorter and more transverse truncate distad than in *burri*. The elytra differ from those of *burri* and *reditus* in being pale-bordered laterad while the femora are fuscous proximad as in *reditus*, and not pale unicolorous as in *burri*. The forceps of the female are more elongate than in *reditus*, but less so than in *burri*.

Type.—♂; Mainit River, Mount Apo, Davao-Cotabato Provinces, Mindanao, Philippines. Elevation, 6000 feet. September 22, 1930. (C. F. Clegg.) [Academy of Natural Sciences of Philadelphia, Type no. 5723.]

Size large for genus (length of body with forceps, 11 mm.); general form superficially resembling that of various Palearctic species of *Forficula*; surface shining, of abdominal tergites finely impresso-punctulate.

Head subcordiform with occipital line subtruncate as seen in dorsal aspect, the length of the head slightly greater than the breadth across the eyes (as 33 to 29), latter not at all prominent, their length slightly less than that of postocular portion of the genae, the outline of the latter as seen from dorsum faintly converging caudad to the rather narrowly rounded caudo-lateral angles; surface of occiput well rounded transversely, less markedly so longitudinally; antennae with at least thirteen articles,¹⁹ of the type usual in *Nesogaster*, proximal article slightly longer than third (as 7 to 6).

Pronotum subquadrate, slightly broadening caudad, the greatest breadth caudad (as 33) slightly greater than median length (as 31) and both greater than cephalic breadth (as 29); cephalic margin subtruncate, lateral ones moderately arcuate cephalad and caudad, nearly straight in the middle, slightly but appreciably diverging caudad, caudal margin low arcuate, latero-cephalic angles moderately rounded, caudo-lateral ones more broadly so; disk broad and full, in cephalic half narrowing caudad and at caudal margin occupying but one-third of pronotal breadth, with a subobsolete transverse surface impression mesad and broken indications of a medio-longitudinal impression, lateral areas narrow cephalad, evenly widening caudad, the immediate vicinity of the subcingulate lateral margins flexed dorso-laterad.

Elytra relatively short, individually rectangulate, their humeral length equal to 1.5 times the median length of pronotum, their length distad of pronotum somewhat greater than the same pronotal dimension (as 35 to 31), breadth of a single elytron slightly more than three-fifths of the elytral length distad of the pronotum (as 23 to 35); lateral margins arcuato-truncate, latero-cephalic angle rather narrowly rounded, disto-lateral angle more broadly arcuate, distal margin arcuato-truncate, sutural margin arcuato-truncate; surface of elytra bearing a broad but very shallow and not clearly defined impression which extends obliquely from the latero-cephalic angle to near the middle of the sutural margin and then subparallels the latter some distance distad, cingulation of humeral angle pronounced and attenuately rounding into the distal margin; lateral field of elytra moderately inflexed, evenly narrowing in width from near its base. Wings not evident.

¹⁹ That is a single antenna (right) which may not be complete; the left one is definitely incomplete. See remarks for discussion of the number of antennal articles.

Abdomen moderately narrowing proximad, lateral folds on third and fourth tergites distinct but not pronounced; anal segment transversely rectangular, its median length contained 2.5 times in its width, lateral margins subparallel, distal margin transverse with three quite shallow concavities, one dorsad of each forceps base and the third dorsad of the pygidium, of about equal emphasis, surface of segment proximo-laterad with a group of minute asperities, meso-distad there is a broad and exceedingly shallow surface impression which bears at its proximal edge a very short medio-longitudinal deep incised groove, as is found in other species of the genus; forceps in general form essentially as in a number of species of the genus *Forficula*, consisting of a proximal depressed section sublamellate on its internal side, and a distal more slender, caliper-like portion, subarcuately converging toward its fellow, the tips of which are slightly uncinat, the length of the whole roughly subequal to that of the exposed abdomen and anal segment combined, external outline shallowly concave in proximal half, distinctly arcuate distad, internal margin of sublamellate proximal section slightly sinuate in basal half and internally straight thence distad to a quite marked distad-directed tooth at the extremity of the lamellate section, the proximal three-fifths of this margin with numerous longitudinally disposed minute asperities, dorsal surface of the broader proximal half bearing an oblique impression extending from the external side of the base to the marginal tooth, the immediate base of the forceps arms on external two-thirds with a group of asperities, and briefly dorsad of the terminal tooth of the lamellate margin there is placed on the dorsal surface a small but distinct tuberculi-form but rounded node, distal section of forceps with the portion from their widest arcuation to apices more obliquely than arcuate convergent; pygidium faintly surpassing the terminal tooth of the lamellate section of the forceps, styliform throughout, very slender, its greatest proximal width but faintly broader than one-fourth of the pygidial length (as 10 to 38), narrow apex well rounded, dorsal surface rounded transversely, in profile the pygidium very faintly decurves distad; subgenital plate transverse, its proximal breadth nearly 2.3 times the median length (as 21 to 48) free margin arcuate between lateral bases with a slight flattening and emargination mesad.

Limbs of the character usual in the genus, the femora inflated and the tibiae definitely compressed; caudal metatarsus subequal in length to that of the other caudal tarsal articles combined.

Allotype.—♀; same data as type. [Academy of Natural Sciences of Philadelphia.]

Differing from the above description of the male sex (type) in the following noteworthy features.

Size slightly smaller; general form resembling that of females of other species of the genus which have been examined.

Anal segment less strongly transverse than in male, the median length contained 2.1 times in its proximal width, lateral margins slightly converging distad, distal margin subobsoletely concave mesad, thence laterad subobliquely truncate to the external side of the forceps base, its surface with minute asperities, these generally widely scattered except proximo-laterad concentrations and also a meso-distal series, surface impression essentially

as described for male; forceps of the type usual in females of *Nesogaster* but proportionately more slender and attenuate; their length equal to 1.25 times that of the elytra at the humeral angle (as 50 to 40), the proximal breadth of a single arm but one-third of its length, apices moderately but not at all strongly recurved, not definitely hooked, pre-basal lobes with their distal margin binodose, post-lobe excision marked, of the usual depth but narrow longitudinally, and in consequence less evident from dorsum unless specimen is viewed in dorso-caudad aspect, ventro-internal margin rather irregularly serrulate but this is obsolete distad, dorso-internal margin quite marked between post-lobe excision and the distal fourth, usual rounded tubercle at dorso-distal base of pre-basal lobe distinct; pygidium of the type found in females of species here described but distal lateral spiniform teeth quite marked, and with intervening section of dorsal surface less strongly elevated than in other forms and concave transversely between the teeth; subgenital plate transverse subtrigonal, median length contained almost twice in proximal breadth, apex of margin moderately rounded.

Coloration.—In general above piceous, lightening on the dorsum of the abdomen to maroon in certain females. Head occasionally paling to tawny (in one Galog River female paratype and in several immature individuals); proximal antennal articles (one to three) ochraceous-tawny, very few antennae are complete and in but two complete antennae is there a pale cream-colored area distad, this involving but one article which may be the ultimate or the penultimate. Pronotum with pale lateral borders yellow ocher. Elytra in adults to a greater or lesser degree longitudinally bordered with dull yellow ocher in the dorsal field adjacent to the humeral carina, this failing to reach the distal margin and narrowing proximad. Forceps and pygidium of hay's russet to ferruginous (latter in minimum-sized male paratype from Mainit River), forceps darkening distad in males. Limbs of the contrasted coloration noted in most of the other species of the genus here described, but the pale section of the femora is somewhat more extensive and reaches proximad to nearly the middle of the femur.

Measurements (in millimeters)

	Length of body (ex- clusive of forceps)	Length of pronotum	Length of elytron	Length of forceps	Length of male pygidium
♂, Mainit River, Mindanao, type.....	8.6	1.6	2.4	4.2	2.1
♂, Mainit River, Mindanao, paratype.....	5.7	1.3	1.6	2.7	1.1
♂, Galog River, Mindanao, paratype.....	7.5	1.4	2.1	4.0	2.1
♂, Galog River, Mindanao, paratype.....	6.5	1.3	1.8	2.9	1.3
♀, Mainit River, Mindanao, allotype.....	8.1	1.6	2.2	2.4	..
♀, Galog River, Mindanao, paratype.....	8.9	1.4	1.9	2.1	..

Variation.—As the above figures show, there is a very marked size range in the male sex, and that this occurs at more than a single locality in the same general area, but in the female, as far as available material goes, size

variation is much less evident. The size discrepancy between the largest and smallest males is surprisingly great, but the two Galog River males supply intermediate measurements between the Mainit River extremes.

As but three individual antenna are unquestionably complete in the specimens of *apoensis* which have been examined, it is difficult to say what the range in number of antennal articles may be in the species. But a single paratypic male (from the type locality) has both antennae complete and from this we can conclude that in an individual there may be a difference of one article, as one of these has fourteen and the other fifteen articles. The type has but one antenna which appears complete, but it may not be, and this has but thirteen articles. It would seem that the penultimate article is the one which is usually pale, and no individual with complete antenna shows more than a single article so colored. The type has the ultimate pale in its more complete antenna, but this has but thirteen articles and possibly one is missing. An immature individual from the Galog River has one antenna complete with fourteen articles, none of which is pale.

Remarks.—This *Forficula*-like species is known only from the slopes of Mt. Apo, on the boundary of Davao and Cotabato Provinces of Mindanao, the series before me having been taken on the Mainit and Galog Rivers at 6000 feet elevation. All the adult material examined, additional to the type and allotype, is considered to be paratypic.

Specimens examined: 11; 5 ♂, 4 ♀, 2 juvs.

MINDANAO, PHILIPPINES: Mainit River, Mt. Apo, elevation 6000 feet; IX, 22 and XI, 6, 1930; (C. F. Clegg); 3 ♂, 3 ♀ 1 juv., *type*, *allotype* and *paratypes*; [A.N.S.P.]. Galog River, Mt. Apo, elevation 6000 feet; IX, 26 and 28, 1930; (C. F. Clegg); 2 ♂, 1 ♀, *paratypes*, 1 juv.; [A.N.S.P.].

ON THE PUNCTULATUS SPECIES-GROUP OF THE GENUS MELANOPLUS
(ORTHOPTERA, ACRIDIDAE, CYRTACANTHACRIDINAE), WITH
THE DESCRIPTION OF A NEW SPECIES FROM KANSAS

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In the latter part of 1944 Dr. R. H. Beamer, of the University of Kansas, sent to my colleague Mr. Morgan Hebard for determination several specimens of a striking species of *Melanoplus* from near Sun City, Kansas. Due to Mr. Hebard's inability to examine the material, on account of his absence under medical treatment, it was not critically studied until Dr. Beamer in April, 1945 asked me to give him an opinion on the species. It was soon evident that these specimens represented an undescribed species of the Punctulatus Group of the genus, more nearly related to the New Mexican *M. splendidus* Hebard than to the more eastern *punctulatus*. Subsequently Dr. Beamer sent to me for study several lots of specimens of this species, including the entire series taken in 1944, and also a larger representation secured in 1945, when a special re-examination of the original locality was made. It is thus possible to describe this new species from the evidence of a considerable series, a condition quite desirable but seldom possible. Drs. Hungerford and Beamer have kindly permitted me to retain the type and allotype, and a portion of the paratypic material, for the Academy's collection, a sincerely appreciated courtesy.

In analyzing the relationship of this new species it was necessary to examine all the known forms of the *Punctulatus* species-group of *Melanoplus*, as a result of which it was evident that material which previously had been referred broadly to *M. punctulatus* represented two quite distinct geographic races, one restricted chiefly to New England and the Atlantic coastal slope of the Middle Atlantic States, and the other found over the known area of distribution of the species in the Mississippi valley drainage, intruding areally into coastal drainage sections. While the latter had not been recognized in recent work, there fortunately are several previously published names available for it, the oldest being *Caloptenus griseus* Thomas, 1872, which long had been synonymized under *punctulatus*.

In addition to the material of the new *Melanoplus macclungi* mentioned above, I have also had before me representatives of the Punctulatus species-group from the collection of the United States National Museum, as well as from that of the University of Kansas other than their series of *macclungi*,

plus the series in the collection of the Academy of Natural Sciences of Philadelphia. I have also studied important historic material in the Museum of Comparative Zoölogy collection. My thanks are due to the various officials in charge of these collections for their courtesy and cooperation.

In connection with the present study a total of 420 specimens has been examined, from the following sources: Academy of Natural Sciences of Philadelphia, 275; University of Kansas, 107; United States National Museum, 31; and the Museum of Comparative Zoölogy, 7.

The *Punctulatus* species-group is now known to consist of three species, one of which breaks into three geographic races. These units are: *M. punctulatus* (Scudder),¹ which ranges from Ontario and New England west to Minnesota and eastern Nebraska and Kansas, southward to Florida and Texas, breaking up into three geographic races, i.e., *M. p. punctulatus* (Scudder), *M. p. arboreus* Scudder,² and *M. p. griseus* (Thomas);³ *M. splendidus* Hebard,⁴ known from mountain areas of Colorado and New Mexico and the Coconino Plateau of Arizona; and *M. macclungi*, of south-central Kansas, here described.

The three subspecies of *M. punctulatus* are treated in detail in following pages, but briefly *M. p. punctulatus* may be said to occur in parts of eastern Canada, New England, New York, Pennsylvania east of the Appalachian ridges and plateaus, and the Atlantic coastal section south to Virginia, intergrading to the southward into *M. p. arboreus* of the lower country of the southeastern and southern states, while across the Appalachian watershed it passes into *M. p. griseus* of the Mississippi Valley region. The relationship and intergradation of *M. p. punctulatus* and *M. p. arboreus* has already been discussed by Rehn and Hebard,⁵ who then also commented upon variation in the male cercal form found in material at that time considered to represent *M. p. punctulatus*, but which now is known to have included representatives of both restricted *punctulatus* and *p. griseus*.

From the form of the aedeagus of the males of *splendidus* and *macclungi* it is evident they are quite closely related, and equally distinct from the various elements making up *M. punctulatus*. This, added to other similarities, leads me to believe *splendidus* and *macclungi* probably had a

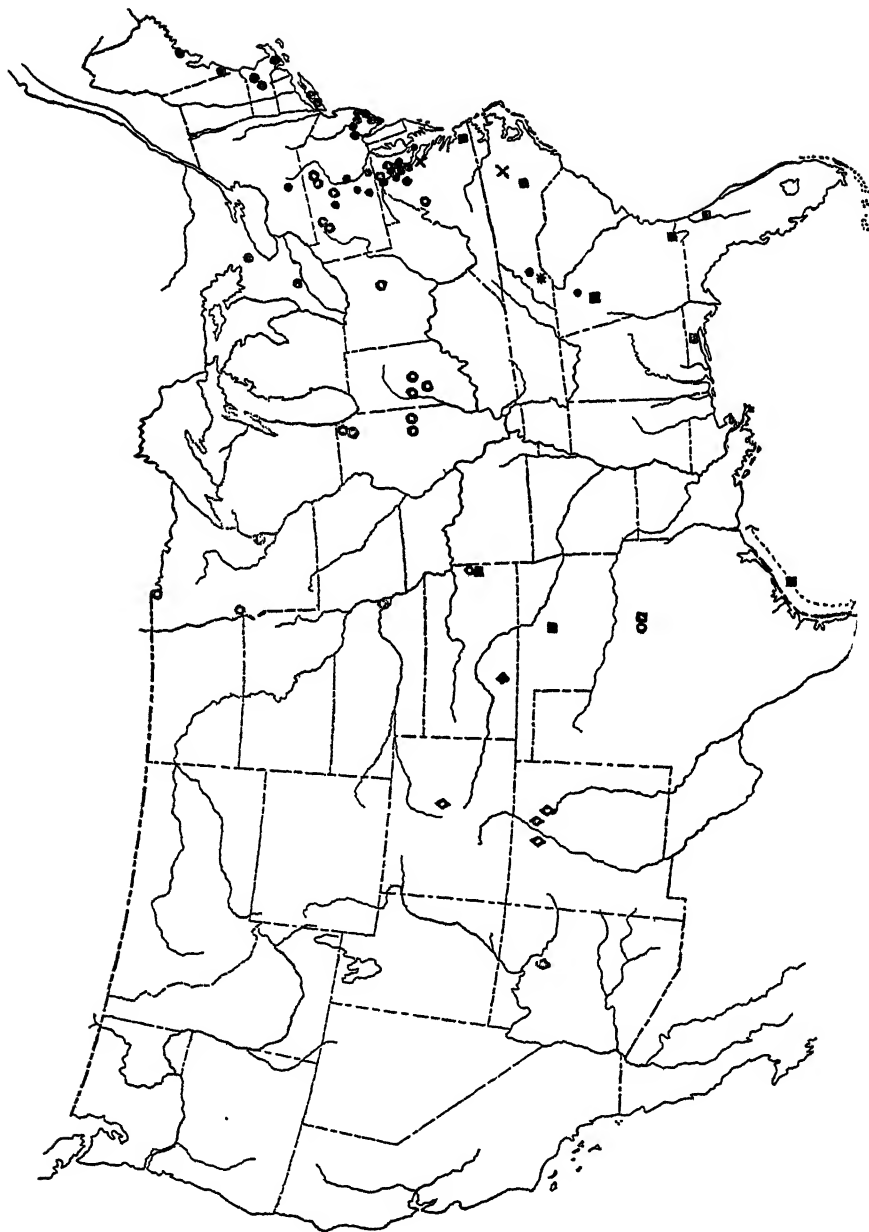
¹ Boston Journ. Nat. Hist., VII, p. 465, (1862). [♀; Maine.]

² Proc. Amer. Philosoph. Soc., XXXVI, p. 31, (1897); Proc. U. S. Nat. Mus., XX, p. 372, pl. 25, fig. 5, (1897). [♂, ♀; Dallas, Texas (subsequently selected type locality); Gulf Coast of Texas.]

³ *C[aloptenus] griseus* Thomas, Ann. Rep. U. S. Geol. Surv. Montana, V, p. 454, (1872). [♀; Ohio.]

⁴ Trans. Amer. Entom. Soc., XLVI, p. 364, pl. XVI, figs. 5-7, (1920). [♂, ♀; Jemez Hot Springs, Jemez Mountains, New Mexico.]

⁵ Proc. Acad. Nat. Sci. Phila., 1916, pp. 246-248, (1916).



Distribution of members of the *Punctulatus* species-group on the basis of material before the author, omitting purely state records and ones of doubtful authenticity (i.e. "Arizona" record of *M. p. punctulatus*). Symbols: solid dots, *M. p. punctulatus* typical and atypical; oblique crosses, intermediates between *M. p. punctulatus* and *P. arboreus*; circles, *p. griseus* typical and atypical; squares *p. arboreus* typical and atypical; asterisk, intermediate between *p. punctulatus*, *p. arboreus* and *p. griseus*; hollow diamonds, *M. splendidus*; solid diamond, *M. macchugli*.

relatively recent common ancestry, although their present ranges are separated by some hundreds of miles of territory, and their habitats are quite dissimilar in general conditions and environment. On aedeagal characters alone these two species can be separated from *punctulatus* with little difficulty. However, the three subspecies of *M. punctulatus* have quite evident aedeagal differences in addition to well-marked male cercal characters in their typical individuals. The geographic interdigitation of the three subspecies of *M. punctulatus* is complex, and is discussed at length under *M. p. punctulatus*.

The following key for the separation of the members of the species-group is based on the more obvious characters. Aedeagal characters have not been included as they are difficult to use in a dichotomous key, and for them reference should be made to the accompanying figures.

Key to the Members of the Punctulatus Species-Group

Males

1. Antennae with most of the articles individually more elongate and more slender. Prosternal spine more elongate, proportionately more slender. Male cercus definitely flabelliform distad, its greatest breadth in distal half. (Cephalic and median femora more elongate, less inflated.) 2

Antennae with most of the articles individually shorter and less slender. Prosternal spine stubbier, stouter, and quite blunt. Male cercus with distal section bent dorsad but not at all flabelliform, its greatest breadth at base 4

2. Size smaller (body length, 18.9 to approximately 24 mm.). Caudal femora more slender as viewed in profile. Cercus with dorsal production of apical section not sharply acute. Subgenital plate with distal node less produced and less inflated 3

Size larger (body length, 26 to 32.8 mm.). Caudal femora deeper and more robust as viewed in profile. Cercus with dorsal production of apical section sharply acute. Subgenital plate with distal node more produced and more inflated. (Eyes prominent laterad as viewed from dorsum. For aedeagus see fig. 7.)

punctulatus arboreus Scudder

3. Eyes less prominent as seen in cephalic aspect. Pronotum less flaring ventro-caudad as seen from dorsum. Cercus with dorsal lobe of the distal flabellate broadening definitely shorter than depth of remainder of cercus, its dorsal margin subacute. (For aedeagus see fig. 3.) *punctulatus punctulatus* (Scudder)

Eyes more prominent as seen in cephalic aspect. Pronotum more flaring ventro-caudad as seen from dorsum. Cercus with dorsal lobe of the distal broadening subequal to depth of remainder of cercus, its dorsal margin broadly rounded. (For aedeagus see fig. 10.) *punctulatus griseus* (Thomas)

4. Average size smaller (length of body, 23.8 to 25.7 mm.). Cephalic and median femora but moderately inflated as seen from the dorsum. Fastigial area less inflated, less expanded laterad about eyes. Median carina of pronotal metazona thinner and more delicate. Caudal femora with ventro-external carina less strongly arcuate expanded ventrad as viewed in profile. Cercus of male with distal half dorsad more sublobate than falcate. Distal tubercle of subgenital plate of male not distinctly divided into two. (For aedeagus see fig. 12.) *splendidus* Hebard

Average size larger (length of body, 27.5 to 33 mm.). Cephalic and median femora very distinctly inflated as seen from dorsum. Fastigial area more inflated, more extended laterad about eyes. Median carina of pronotal metazona thicker, stouter and much stronger in emphasis. Caudal femora with ventro-external carina more strongly arcuate expanded ventrad as viewed in profile. Cercus of male with distal half dorsad more evenly falcate (see fig. 15). Distal tubercle of subgenital plate definitely divided into two lateral nodes. (For aedeagus see fig. 16.) *macchungi* new species

Females

1. Ovipositor valves more slender, more compressed, in profile straighter and less strongly hooked distad 2

Ovipositor valves stouter, thicker, in profile more recurved distad 4

2. Size smaller (body length, 26 to 31.8 mm.). Metazonal section of pronotum but moderately flaring latero-caudad as seen from dorsum. Caudal femora more slender as viewed in profile 3

Size larger (body length, 37.5 to 42.5 mm.). Metazonal section of pronotum markedly flaring latero-caudad as seen from dorsum. Caudal femora deeper and more robust as viewed in profile. (Eyes relatively prominent laterad as head is viewed from dorsum. Female cercus exceedingly short, quite broad and blunt.)

punctulatus arboreus Scudder

3. Eyes less prominent as seen in cephalic aspect *punctulatus punctulatus* (Scudder)

Eyes more prominent as seen in cephalic aspect, particularly dorsad.

punctulatus griseus (Thomas)

4. Average size smaller (body length, 28.5 to 38.2 mm.). Fastigial area less inflated, little bullate as seen from dorsum, relatively narrower. Median carina of pronotal metazona thinner and more delicate. Ovipositor valves, particularly ventral ones, more attenuate *splendidus* Hebard

Average size larger (body length, 32.3 to 42.2 mm.). Fastigial area more inflated, appreciably bullate as seen from dorsum, relatively broader. Median carina of pronotal metazona thicker, stouter and stronger in emphasis. Ovipositor valves, particularly ventral ones, less elongate *macclungi* new species

Melanoplus punctulatus (Scudder)

This species is made up of three geographic races which are here treated individually, and under each of which the pertinent references are given. The features separating these races have been set forth in the preceding key.

Specific distribution.—The three subspecies of *punctulatus* range over an area which extends north to Maine, New Hampshire, Vermont, New York, southern Ontario, the southern peninsula of Michigan and northern Minnesota, south to northern Florida and Texas, and from the eastern seaboard west to eastern Nebraska, eastern Kansas, central Oklahoma and north-eastern Texas. No material is available from considerable areas within this extensive distribution, and the points here given are merely the peripheral ones. The habits of the forms of *punctulatus* are such that usually it is unnoticed unless particular search is made for it.

The three component subspecies of *punctulatus* are briefly, a medium-sized northeastern race (*M. p. punctulatus*), a much larger southern one (*M. p. arboreus*), and a western race of much the same size as the typical form (*M. p. griseus*). In the male sex each has distinctive characters of both the cercus and the aedeagus, as well as correlated body proportions. While these three elements definitely intergrade in certain areas, and therefore are clearly subspecies, they do so in a rather unusual fashion. There is an interdigitation of these races in what might be called tension areas with true intermediates the exception and not the rule. It would seem to me that the segregation of the respective components of *M. punctulatus* is far advanced, and, as real intermediates are unusual on these contact lines, the

evolutionary cycle which would eventually produce distinct specific entities of these forms must be far from new and probably is not far from completion. If evidence of intergradation and the passage from one form to another was not as conclusive as it is, there would be no hesitation in considering these forms as distinct species, the structural differences between them being so marked, particularly those distinguishing *M. p. griseus*. It has been necessary in assigning material from certain restricted areas to the respective subspecies to place one part of a locality's representation under one form, and another part under a different one. While this may seem contradictory and illogical, it is a true picture of what we find, the series from single localities in tension areas breaking just as sharply and as decidedly as this arrangement would indicate. Under *p. punctulatus* I have discussed the general question of its relation to the other two forms, which should be read to understand the problem.

Melanoplus punctulatus punctulatus (Scudder) Text-figs. 1-4; plate 1, fig. 19.
1862. *C[aloptenus] punctulatus* Scudder, Boston Journ. Nat. Hist., VII, p. 465. [♀; Maine.]

1916. *Melanoplus punctulatus punctulatus* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1916, p. 246. (Combination.)

Type material.—The original material of *punctulatus* consisted of a single female from Maine taken by Packard. This specimen is in the Scudder series at the Museum of Comparative Zoölogy, being "Type no. 16140". It is badly molded and discolored but is clearly *M. p. punctulatus*. As the abdomen is abnormally extended I am not presenting measurements of the type, which is identical in its features with other well preserved Maine material here reported.

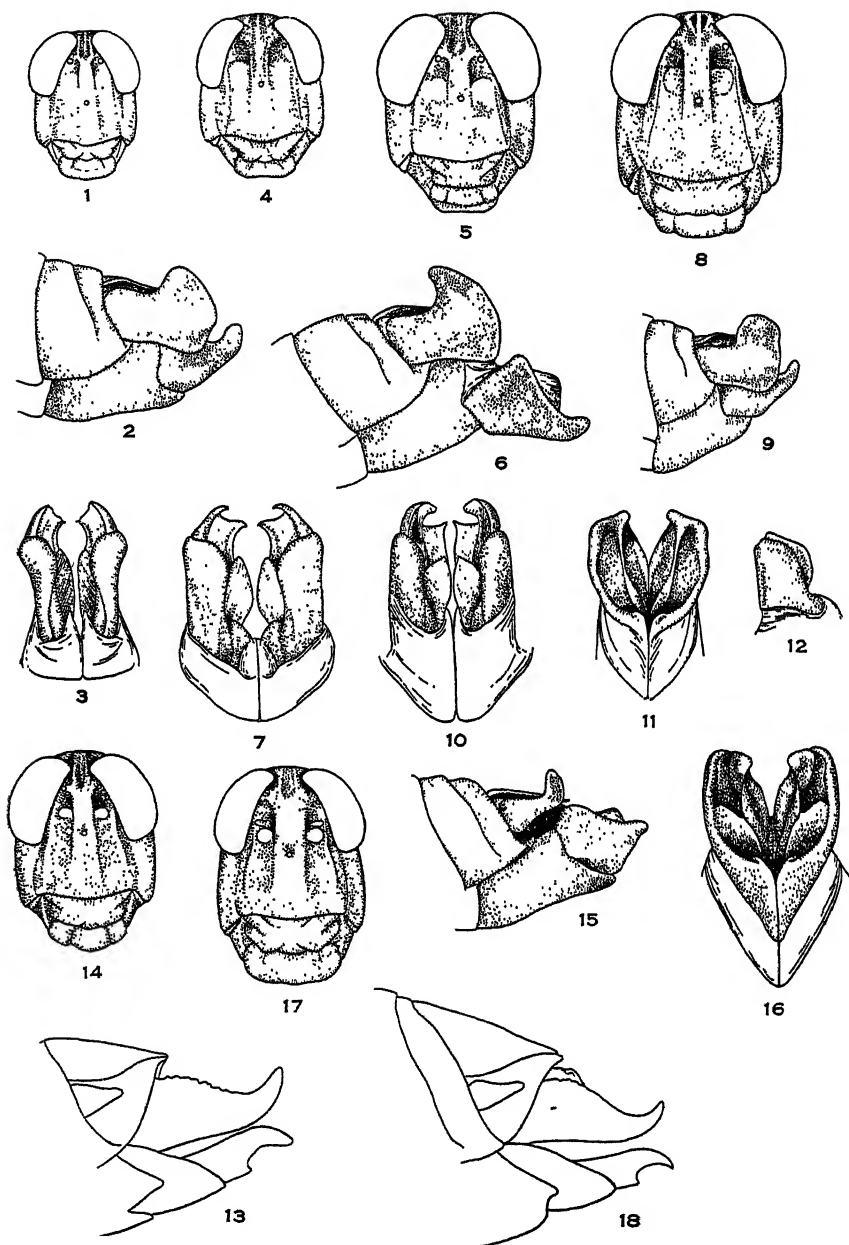
Melanoplus punctulatus punctulatus (Scudder). Male; Rockport, Maine. Fig. 1.—Cephalic view of head (×4). Fig. 2.—Lateral view of apex of abdomen (greatly enlarged). Male; Mt. Agamenticus, Maine. Fig. 3.—Caudal aspect of exerted aedeagus (greatly enlarged). Female; Rockport, Maine. Fig. 4.—Cephalic view of head (×4).

Melanoplus punctulatus arboreus Scudder. Male; Southern Pines, North Carolina. Fig. 5.—Cephalic view of head (×4). Fig. 6.—Lateral view of apex of abdomen, subgenital plate deflexed to expose internal genitalia (greatly enlarged). Fig. 7.—Caudal aspect of exerted aedeagus (greatly enlarged). Female; Lake Drummond, Virginia. Fig. 8.—Cephalic aspect of head (×4).

Melanoplus punctulatus griseus (Thomas). Male; Near Pigeon, 8 miles N. W. of Marienville, Forest Co., Pennsylvania. Fig. 9.—Lateral view of apex of abdomen (greatly enlarged). Male; Cavallo, Ohio. Fig. 10.—Caudal aspect of exerted aedeagus (greatly enlarged).

Melanoplus splendidus Hebard. Male (paratype); Jemez Hot Springs, New Mexico. Fig. 11.—Caudal aspect of exerted aedeagus (greatly enlarged). Fig. 12.—Lateral view of distal extremity of aedeagus (greatly enlarged). Female; 2 miles E. of Tesuque Pueblo, New Mexico. Fig. 13.—Lateral outline of apex of abdomen (greatly enlarged).

Melanoplus macclungii new species. Male (type); Sun City, Kansas. Fig. 14.—Cephalic view of head (×4). Fig. 15.—Lateral view of apex of abdomen (greatly enlarged). Male (paratype); Sun City, Kansas. Fig. 16.—Caudal aspect of exerted aedeagus (greatly enlarged). Female (allotype); Sun City, Kansas. Fig. 17.—Cephalic view of head (×4). Fig. 18.—Lateral outline of apex of abdomen (greatly enlarged).



(Explanation at bottom of page 246.)

Principal features.—The typical form of *punctulatus* over the bulk of its range is more uniform in its features than is the more western *M. p. griseus*, and probably this is also the case when it is compared with the Austroriparian *M. p. arboreus*, although the available series of the latter form is too limited to warrant drawing a similar conclusion. The chief characters of value in distinguishing the forms, as shown by the preceding key, are the form of the male cerci and of the aedeagus of the internal genitalia of the same sex, correlated with which in *p. punctulatus* is an appreciably lesser prominence or tumidity of the eyes, which is a feature found in both sexes. The pronotum is slightly more narrowed and less expanding caudad in *p. punctulatus* than in the other subspecies.

The male cercus has the distal half distinctly and quite broadly flabellate,⁶ with its dorsal lobe distinctly shorter than the depth of the remainder of the cercus, and its dorsal angle subacute. When compared with the broad boot-like shape of the same area in *M. p. griseus*, and the more sharply produced and acute dorsal angle of the cercus in *M. p. arboreus*, true *punctulatus* should be distinguished in its typical condition with little difficulty.⁷ The form of the aedeagus of the male (see fig. 3) is nearer that found in *M. p. arboreus* than it is to that of *M. p. griseus*. In this feature *M. p. punctulatus* and *M. p. arboreus* are seen to be definitely closer to one another than either is to *M. p. griseus*, although the size of the latter is essentially the same as that of *M. p. punctulatus*, and *M. p. arboreus* typically is distinctly larger in both sexes.

For a description of the general form and coloration of *M. p. punctulatus* I would refer the student to that given by Morse in his "Manual of the Orthoptera of New England."⁸

Distribution.—The typical form of *punctulatus* ranges from southern Maine (Rockport), north-central New Hampshire (North Conway), Vermont, southern New York (Ulster County and Ithaca area), and southern Ontario (Lake Simcoe), southward as far in the Piedmont as Thompsons Mills, northern Georgia. From New York and Ontario all the material seen is typically *p. punctulatus*; in Pennsylvania that form apparently extends to, and is intrusive up the valleys west of, the Susquehanna River, being replaced there on the summits of the ridges and plateaus by the more western *M. p. griseus*. In Maryland and Virginia we find on the western border of the distribution of the typical form a peculiar situation, which,

⁶ Scudder's 1897 figure is fairly accurate (Proc. U.S.N.M., XX, pl. XXV, fig. 4), but that here given (fig. 2) will be found more useful for comparison.

⁷ "Atypical" material, as graded by me, can be defined as varying away from the typical condition toward some of the related forms, but yet not departing sufficiently from the norm of the form to which it is referred to be considered intermediate between the two.

⁸ Proc. Boston Soc. Nat. Hist., XXXV, p. 511, (1920).

however, is reflected in a similar distributional pattern in that area in certain other animals. Intrusively southeastward a marked *M. p. griseus* influence extends down the immediate vicinity of the Potomac River as far as Plummer's Island, Maryland, a relatively short distance upstream from Washington, D. C. Individuals from the Potomac section from Plummer's Island westward show an intermingling of *p. punctulatus* and *p. griseus* which makes evident that this is a definite tension area. To the southward in adjacent Virginia but away from the Potomac Valley typical *p. punctulatus* is present, just as west of the Blue Ridge on the Shenandoah Massanutts we have atypical *M. p. griseus*. In tidewater eastern Virginia we find the passage into the Austroriparian *M. p. arboreus* as irregular as that to *M. p. griseus* is to the westward. In the Dismal Swamp section of southeastern Virginia, and also at Southern Pines, North Carolina, the representations of *M. punctulatus* are typical and atypical of *M. p. arboreus*, while from Tappahannock, Virginia, on the lower Rappahannock, and at Raleigh, North Carolina the material seen is definitely intermediate between *M. p. punctulatus* and *M. p. arboreus*. A single specimen from Blantyre, Transylvania Co., North Carolina, is particularly interesting as it is definitely an intermediate between the three forms of *punctulatus*, while an Asheville, North Carolina male is atypical of *p. punctulatus*.

To fully understand the interdigitation of the forms of *punctulatus* it is necessary to compare the localities listed under the three subspecies with the accompanying map on which they have been placed.

Intergradation.—An analysis of the intergradation of this form with the other components of *M. punctulatus* is so closely associated with the distribution of *p. punctulatus* that it has been summarized under the latter in the preceding paragraphs. Hence the comments here are purely in amplification. The instability of *M. punctulatus* on Plummer's Island on the Potomac River in Montgomery County, Maryland, and in the area immediately surrounding, is exceptionally interesting. Here taken together under identical conditions we find typical material of *M. p. punctulatus* and atypical individuals of *M. p. griseus*. Also at Point of Rocks, Maryland, farther up the Potomac Valley, near Harper's Ferry, West Virginia, we find the same conditions represented by single specimens of opposite sexes taken years apart. Localities from the Virginia Piedmont to the south of the Potomac Valley are represented by typical *M. p. punctulatus*, but when the Blue Ridge is crossed we find on the Massanutts, a longitudinal dividing ridge in the Shenandoah Valley, that the material is atypical *M. p. griseus*. In Pennsylvania the valleys pushing into the Allegheny section carry *M. p. punctulatus* from the east, but the escarpments and ridges above them are inhabited by *M. p. griseus*. A similar irregular intergradation is evident in

the contact of *M. p. punctulatus* and *M. p. arboreus* in tidewater southeastern Virginia and in the Piedmont of North Carolina, as a glance at the accompanying map and an examination of the localities represented by the annexed listing of material will make evident. The general mixture of features found in the Blantyre, North Carolina specimen indicates the tension area in which tendencies from three areas are in contact, and hence it is an intermediate between *M. p. punctulatus*, *M. p. arboreus* and *M. p. griseus*.

We are without information as to exactly where *M. p. punctulatus* grades into *M. p. griseus* in western New York, and also whether Michigan material, of which I have none, is not *M. p. griseus*, as I am assuming it is.

Size.—Typical *M. p. punctulatus* is rather uniform in size, particularly in the female sex. Typical pairs, and extremes of series of males from the same localities, give the following figures (in millimeters), which can be used for comparison with those of related subspecies:

	Length of body	Length of pro- notum	Length of tegmen	Length of caudal femur
♂, Queen's Park, Ontario	18.9	4.3	16.2	10.5
♂, Rockport, Maine	20.5	4.4	16.1	11.
♂, Rockport, Maine	22.	4.7	17.3	12.2
♂, Ithaca, New York	20.5	4.8	16.3	11.9
♂, Eagleswood Bog, New Jersey	23.2	5.	17.	12.5
♂, Plummer's Island, Maryland	22.6	4.8	16.9	12.2
♂, Falls Church, Virginia	19.1	4.3	15.5	11.2
♂, Falls Church, Virginia	22.5	4.9	17.8	13.
♂, Thompsons Mills, Georgia	26.10	5.	19.	13.
♀, Rockport, Maine	29.5	5.7	19.	13.2
♀, Ithaca, New York	27.6	6.1	20.	14.8
♀, Stafford's Forge, New Jersey	29.3	6.	20.	15.
♀, Plummer's Island, Maryland	29.	5.7	19.	14.1
♀, Falls Church, Virginia	31.8	6.1	21.89	15.3
♀, Thompsons Mills, Georgia	36.11	7.	21.	16.3

From the above it will be seen that the male sex shows slightly more size variation than the females, and that while there is a gradual size increase southward, as is usual in many Orthoptera, individual variation in the male sex, from single localities when series are available, may largely cover the size range shown by the geographic tabulation.

Bionomics.—The dendrophilous habits of this form and its allies are now well known, and need not be dwelt upon here. They have been summarized by Blatchley¹² and Morse,¹³ and stressed in most instances where any of the subspecies of *punctulatus* have been referred to.

⁹ Apices somewhat damaged.

¹⁰ Apex of abdomen extended by extrusion of internal genitalia for examination.

¹¹ Abdomen abnormally extended, hence length excessive.

¹² Orth. N. E. Amer., pp. 450-452, (1920).

¹³ Proc. Boston Soc. Nat. Hist., XXXV, pp. 511-514, (1920).

The earliest exact date I have seen represented by adult material is July 7 (Ithaca, New York), while a single specimen from Sherborn, Mass., is labelled July without date. Immature material before me, in the instar preceding maturity, was taken as late as August 6 (Howard, Penna.). The period of greatest abundance is August to October, with the last date represented being November 12, this by a single specimen labelled merely "Virginia", although it was taken in some numbers at Plummer's Island, Md. as late as November 11. The November dates are not all from southern localities, as it was captured at Six Mile Creek, near Ithaca, New York, on November 7, at which time that area is relatively cold, and has had numerous heavy frosts.

Specimens examined: 122; 63 ♂, 57 ♀, 2 juvs.

Typical *M. p. punctulatus*

ONTARIO: De Grassi Point, Lake Simcoe; IX, 6 and 27, 1899; (E. M. Walker); 1 ♂, 1 ♀; [A. N. S. P.]. Queen's Park, Aylmer; VIII, 18 and 22, IX, 3, 1924; (A. R. Graham); 2 ♂, 2 ♀; [A. N. S. P.].

MAINE: "Maine"; (Packard); 1 ♀ *type*; [M. C. Z.]. Rockport; VIII, 18 and 28, IX, 1, 12, 14 and 23, 1940-1943; (Hebard and M. E. Chubb; in part on porch near forest, on house step near various conifers); 4 ♂, 4 ♀: VII, 20, 1942; (M. E. Chubb; "near white pines"); 1 juv.; [A. N. S. P.]. Mt. Agamenticus, York County; IX, 5, 1920; (Hebard); 4 ♂, 3 ♀; [A. N. S. P.].

MASSACHUSETTS: Waltham; IX, 18-21, 1943; (M. Hebard); 2 ♂, 5 ♀; [A.N.S.P.]. Sherborn; VII, 1913; (C. A. Frost); 1 ♂; [A.N.S.P.]. Marion; IX, 1, 1905; (M. Hebard; "in pine woods"); 1 ♀; [A.N.S.P.].

NEW YORK: Ithaca; VIII, 2, 1900; IX, 5, 1916; IX, 13, IX, 1937; IX, 18, 1890; IX, 24, 1908; IX, 28, 1888; 4 ♂, 5 ♀; [A.N.S.P.]: (C. R. Crosby); 2 ♂, 2 ♀; [A.N.S.P.]: X, 16, 1936; X, 19, 1938; (J. G. Franclemont; one labelled "at sugar on hickory"); 2 ♀; [A.N.S.P.]: VII, 7, 1917; (E. C. Van Dyke); 1 ♀; [A.N.S.P.]. Six Mile Creek, Ithaca, Tompkins Co.; XI, 7, 1938; (J. G. Franclemont); 1 ♂, 1 ♀; [A.N.S.P.]. Cold Spring, Long Island; IX, 13, 1911; (W. T. Davis); 1 ♂; [A.N.S.P.]. Coram, Long Island; VIII, 18, 1930; (W. T. Davis; "sandy area"); 1 ♂; [A.N.S.P.].

PENNSYLVANIA: Howard, Center Co.; VIII, 6, 1940; (R. C. Casselberry); 1 ♂ juv.; [A.N.S.P.].¹⁴ Clark Creek Valley, Dauphin Co.; X, 26, 1920; (Champlain and Knull); 1 ♂, 1 ♀; [A.N.S.P.]. Carlisle; X, 26, 1931; (E. J. Udine; "on *Pinus strobus*"); 1 ♂, 1 ♀; [U.S.N.M.]. Ridge near Caledonia, Franklin Co.; IX, 10, 1937; (H. R. Roberts); 5 ♂; [A.N.S.P.].

¹⁴ This specimen is in the instar preceding maturity, and the cercal form is clearly indicated as *p. punctulatus*. The locality is at a relatively low elevation (740 feet) in the valley of Bald Eagle Creek, a tributary of the West Branch of the Susquehanna River.

York; X, 9, 1943; (E. T. Moul); 1 ♀; [A.N.S.P.]. Near Philadelphia; IX, 2; (S. F. Aaron; "on tree trunk"); 1 ♀; [A.N.S.P.].¹⁵

NEW JERSEY: Burlington; VIII, 20, 1920; 1 ♀; [A.N.S.P.]. Brown's Mills Junction; X, 6, 1907; (E. Daecke); 1 ♂; [A.N.S.P.]. Between Stafford's Forge and East Plains, Ocean Co.; VIII, 14, 1929; (Rehn and Rehn); 1 ♂, 1 ♀; [A.N.S.P.]. Eagleswood Bog, near Stafford's Forge, Ocean Co.; VIII, 31, 1914; (Rehn); 1 ♂; [A.N.S.P.]. Stafford's Forge, Ocean Co.; IX, 16, 1905; (M. Hebard); 1 ♀; [A.N.S.P.]. Tuckahoe, Cape May Co.; IX, 18, 1934; (H. Fox); 7 ♂, 2 ♀; [A.N.S.P.]. Sea Isle Junction, Cape May Co.; IX, 21, 1934; (H. Fox); 1 ♀; [A.N.S.P.]. Ocean View, Cape May Co.; IX, 23, 1929; (H. Fox; "on *Pinus echinata*"); 2 ♂, 2 ♀; [A.N.S.P.].

MARYLAND: Point of Rocks, Frederick Co.; VIII, 19, 1883; (Pergande); 1 ♂; [A.N.S.P.].¹⁶ Plummer's Island, Montgomery Co., X, 8, 1918, XI, 11, 1915; (M. Hebard); 4 ♂, 3 ♀; [A.N.S.P.].¹⁸ Glen Echo, Montgomery Co.; IX, 28, 1926; (H. K. Bigelow); 1 ♀; [U.S.N.M.]. Point Lookout; IX, 10, 1921; (A. N. Caudell); 1 ♂; [U.S.N.M.].

DISTRICT OF COLUMBIA: Washington; IX, 23, 1908; (A. N. Caudell); 1 ♂; [U.S.N.M.].¹⁷

VIRGINIA: Difficult Run, Fairfax Co.; X, 28, 1917; (W. L. McAtee); 1 ♂, 1 ♀; [U.S.N.M.]. Falls Church; X, 13; 1 ♂, 1 ♀; [U.S.N.M.]: X, 22, 1901; (A. N. Caudell); 4 ♀; [U.S.N.M.]: IX, 30, 1917; (G. M. Greene); 1 ♂; [U.S.N.M.]. Potomac River near Mount Vernon; IX, 2, 1923; (A. N. Caudell); 3 ♂; [U.S.N.M.]. Bull Run Mts. Prince William-Fauquier Cos.; X, 8, 1936; (H. A. Allard); 2 ♀; [U.S.N.M.].

GEORGIA: Thompsons Mills, Jackson Co.; early X, 1910; (H. A. Allard); 1 ♂; [U.S.N.M.]: X, 1909; (H. A. Allard); 1 ♂; 1 ♀; [U.S.N.M.].¹⁷

Atypical *M. p. punctulatus*

VIRGINIA: [no exact locality]; XI, 12, 1892; 1 ♀; [A.N.S.P.]: 1 ♀; [A.N.S.P.].

NORTH CAROLINA: Asheville; VIII, 1897; 1 ♂; [A.N.S.P.].

Intermediate between *M. p. punctulatus*, *M. p. arboreus* and *M. p. griseus*

NORTH CAROLINA: Blantyre, Transylvania Co.; IX, 1906; (R. Woglum); 1 ♂; [A.N.S.P.].¹⁸

Intermediate between *M. p. punctulatus* and *M. p. arboreus*

VIRGINIA: Tappahannock; IX, 9, 1916; (H. Fox; "on low loblolly pines, edge of woods"); 1 ♂, 2 ♀; [A.N.S.P.].

NORTH CAROLINA: Raleigh; X, 1907; XI, 1908; (F. Sherman); 1 ♂, 1 ♀; [A.N.S.P.].

¹⁵ Reported by Rehn, Trans. Amer. Ent. Soc., XXVII, p. 335, (1902).

¹⁶ See also atypical *M. p. griseus*.

¹⁷ Recorded by Rehn and Hebard in 1916 (Proc. Acad. Nat. Sci. Phila., 1916, p. 246).

¹⁸ Recorded as *M. p. punctulatus* by Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1916, p. 246, (1916).

Melanoplus punctulatus arboreus Scudder Text-figs. 5-8; plate 1, fig. 20.

1897. *Melanoplus arboreus* Scudder, Proc. Amer. Philos. Soc., XXXVI, pp. 31, 35: Proc. U. S. Nat. Mus., XX, pp. 139, 372, pl. XXV, fig. 5. [♂, ♀; Dallas Texas; (subsequently selected type locality); Gulf Coast of Texas; "Arizona".]

1916. *Melanoplus punctulatus arboreus* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1916, p. 247. (Combination.)

Original material and type designation.—The original series on which *arboreus* was based consisted of six males and two females, the data being "Dallas, Texas, Boll"; "Gulf Coast of Texas, Aaron"; and "Arizona, Schaupp." The Dallas series came from the Scudder Collection and that of the United States National Museum, while the "Arizona" Schaupp specimen was loaned by Prof. Lawrence Bruner. In 1912 Rehn and Hebard selected as the single type (lectotype)¹⁹ the originally figured male from Dallas Texas. This specimen was reexamined in the Museum of Comparative Zoölogy by me in August, 1946, and the measurements here given were then taken from it. It is labelled "drawn," and also "Type no. 15502". In addition the same collection now contains of the original *arboreus* material the following: a second and third male bearing the same "Dallas, Tex. Boll" label as the lectotype; a female with the same data, which is here considered the allotype; and a single male labelled "Gulf Coast of Texas, Aaron. 1884". These are five of the eight original specimens, and comments on and measurements of all of them are given below.

The "Arizona, Schaupp" specimen was returned by Scudder to Prof. Bruner, and passed to my colleague Mr. Morgan Hebard when he purchased the North and Central American Bruner Collection, and is now in the Academy series, having been received as a part of the Hebard Collection when that entire series was presented by Mr. Hebard in 1945. There can be no question but that the label "Arizona" is erroneous. The collector—Schaupp—lived for some years before the turn of the century at Shovel Mount, Burnet County, Texas, and before that at Round Mountain, Blanco County, Texas, and I feel certain he collected this specimen at one or the other of these localities, and that by some quirk an erroneous locality was placed on it.

Principal features.—The distinctive characters of this subspecies, the austral representative of *M. punctulatus*, are its large size, when compared with *p. punctulatus*, more broadly flabellate distal portion of the male cerci, which latter also have their dorsal point more acutely produced when compared with this area in both *p. punctulatus* and *p. griseus*, the rather deeper and more robust caudal femora, the produced and more inflated distal node of the male subgenital plate, and relatively distinct differences in the aedeagus of the male internal genitalia. Scudder²⁰ considered that the de-

¹⁹ Proc. Acad. Nat. Sci. Phila., 1912, p. 86, (1912).

²⁰ Proc. U. S. Nat. Mus., XX, p. 139, (1897).

gree of development of the furcula was a character separating *p. arboreus* and *p. punctulatus*, but this is valueless, as each form shows an appreciable range in the extent to which these appendages are developed. Rehn and Hebard in 1916²¹ called attention to the less longitudinal metazona of the pronotum in *p. arboreus*, when compared with *p. punctulatus*, and this feature is of assistance in distinguishing females of the former in which the lateral portions of the metazona are appreciably more flaring. The dorsum of the prozona and metazona are also individually somewhat bullate in *arboreus* when compared with the other subspecies.

The male cercus of typical *M. p. arboreus* is very appreciably different from that of typical males of either *M. p. punctulatus* or *M. p. griseus*, but atypical *p. arboreus* or intermediate material is puzzling without comparative typical individuals. Also in size intermediate material usually more nearly approaches the other involved subspecies and hence is very distinctly smaller than typical *M. p. arboreus*. The form of the aedeagus in *arboreus* is definitely nearer that of *M. p. punctulatus* than of *M. p. griseus*, and intermediate material has the aedeagal form as transitional as is that of the cerci and the general body features.

Distribution.—From the evidence now available typical and atypical *M. p. arboreus* is distributed over the Coastal Plain of the southeastern states from the Dismal Swamp region of southeastern Virginia to northern Florida, westward to east-central and coastal Texas (Dallas and "Gulf Coast of Texas"), northward west of the Mississippi across central Oklahoma (Fort Sill (Hubbell 1926) and Perkins) to extreme eastern Kansas (La Cygne). Material from the Dismal Swamp area and also from Southern Pines, North Carolina is both typical and atypical of *M. p. arboreus*. The intergradation with *M. p. punctulatus* has been discussed under that form and the interdigitation of *M. p. arboreus* and *M. p. griseus* is considered under the latter subspecies on a following page. We are without information as to where the line of intergradation or impingement of *p. arboreus* and *p. griseus* may be in the states between North Carolina and Texas and Oklahoma, similarly we have no positive knowledge of the occurrence of *p. arboreus* in any of the states between Georgia and Texas, but we assume from the known peripheral localities, and a personal acquaintance with the general conditions in those states, that it is present there.

Intergradation.—No direct intermediates between *M. p. arboreus* and *p. griseus* have been examined, but the La Cygne, Kansas material here considered *p. arboreus* is atypical, and was taken with typical material of *p. griseus*. As shown in discussion under *M. p. griseus* this is true of material from the Dallas, Texas area. The males of these La Cygne and Dallas *arboreus* are somewhat smaller than typical material from the Dismal

²¹ Proc. Acad. Nat. Sci. Phila., 1916, pp. 246-247, (1916).

Swamp region and the Gulf Coast of Texas, but structurally are quite similar to the larger individuals of that sex considered typical *p. arboreus*. Intergradation with *M. p. punctulatus* has been discussed under that subspecies.

Size.—The undamaged adult material of *p. arboreus* now before me measures (in millimeters) as follows:

	Length of body	Length of pro- notum	Length of tegmen	Length of caudal femur
Typical <i>p. arboreus</i>				
♂, Dismal Swamp, Va.	36.3 ²²	7.3	27.	17.1
♂, Lake Drummond, Va.	31.5 ²²	6.5	25.5	15.3
♂, Southern Pines, No. Carolina	34.3 ²²	7.2	28.2	17.3
♂, Perkins, Oklahoma	32.8	7.1	27.	17.
♂, Dallas, Texas (<i>lectotype</i>)	27.	5.9	23.8	15.1
♂, Dallas, Texas (<i>paratype</i>)	28.	6.2	24.	16.3
♂, Dallas, Texas (<i>paratype</i>) ....	...²³	5.8	24.	14.9
♂, Gulf Coast of Texas (<i>paratype</i>)	32.	7.	28.	17.2
♀, Lake Drummond, Va.	42.5	8.9	30.5	19.
♀, Southern Pines, No. Carolina	38.5	8.4	25.8	18.2
♀, Pomona, Florida	42.5	8.9	28.3	... ²⁴
♀, Dallas, Texas (<i>allotype</i>)	37.5	7.8	27.3	16.9
♀, "Arizona" (<i>paratype</i>)	44.	8.8	30.	21.
Atypical <i>p. arboreus</i>				
♂, Southern Pines, No. Carolina	30.3 ²²	6.	19.2	13.9
♂, La Cygne, Kansas	26.	5.8	22.2	15.
♂, La Cygne, Kansas	29. ²²	5.7	22.2	14.5
♂, La Cygne, Kansas	30.5 ²²	6.1	23.	15.5
♀, Lake Drummond, Va.	29.2	6.6	20.5	15.
♀, La Cygne, Kansas	40. ²⁵	7.8	29.5	18.
♀, La Cygne, Kansas	42.5 ²⁵	7.9	31.	18.5

Relationship.—It is evident from the material before me that *M. p. arboreus* intergrades rather evenly into *M. p. punctulatus*, but that while it and *M. p. griseus* are in contact very probably over a long tension area, they apparently retain to a considerable degree their individual characteristics, and in consequence we find, at least in certain sections, that the two interdigitate and occur in the same area without blending intergradation, although the optimum condition of *M. p. arboreus* is present only in the more austral areas, where it alone occurs. The sections in which we know this interdigitation occurs are Dallas, Texas, and La Cygne, Kansas. An analysis of the measurements here given will show that the largest individuals of *arboreus* are from localities where it alone occurs, and that while the type locality of *M. p. arboreus* is Dallas, it is fully evident on examination that the material from there is not representative of the optimum development of the subspecies. The dorsal portion of the apices of the male

²² Abdominal length excessive, due to extrusion of internal genitalia.

²³ Apex of abdomen missing.

²⁴ Caudal limbs missing.

²⁵ Abdomen somewhat unusually extended, hence this length is slightly excessive.

cerci is narrower in the Dallas males than in that from the Gulf Coast of Texas or the typical Dismal Swamp, Virginia, male representatives. In the material from both of these latter localities this portion of the cercus is somewhat fuller and more ampliate.

It would appear to me that at La Cygne in extreme eastern Kansas, we see the results of a relatively recent intrusion up the Osage-La Cygne river system, from the lower Missouri, of the more austral *M. p. arboreus* influence, there coming in contact with a longer established *M. p. griseus* element, which reached that region, possibly in the Post-Pleistocene, by a different route, from an old center of the *punctulatus* stock, possibly in the non-glaciated southern Appalachians or adjacent Piedmont. The separation of *M. splendidus* clearly long antedated this phase of the group's history.

Bionomics.—Past literature gives virtually no information on the habits of *p. arboreus*. Several of the specimens here listed were taken from the stomachs of wild turkeys or red-shouldered hawks. Another was beaten from high grass under scattered pines, from which it probably had dropped. The sole information of any comprehensiveness available is that sent me (in litt.) by Dr. Raymond H. Beamer, relative to the material of this subspecies and of *M. p. griseus* taken by him at La Cygne, Kansas. Dr. Beamer writes: "The grasshoppers . . . were taken in a forest located on low wet river bottom. The trees were some of the largest remaining in eastern Kansas. Most of the specimens were taken from bits of old trees scattered about. Some, however, were from trunks near the ground. Most of the trees were ash, but the leaves had all fallen [November 6]. I did not succeed in taking a specimen higher up than a couple of feet. Some specimens were taken mating, but I did not find any ovipositing. I was much interested in this latter as Mr. Herr, a botanist who was with me, said the ground was covered with water most of the summer. I noticed the great difference in size [i.e. of *p. arboreus* as contrasted with *p. griseus*] while catching the specimens, yet they all came from an area not more than 100 yards across. Occasionally one would fly but never more than 10-15 feet. They were easily taken with a net, and many I picked off their perches with my hands."

The dates on the available material indicate that *p. arboreus* is adult between August 13 (Dismal Swamp) and November 6 (La Cygne), while an individual in the instar preceding maturity was captured on August 3 at Stone Mountain, Georgia.

Specimens examined: 23; 12 ♂, 10 ♀, 1 juv.

Typical *M. p. arboreus*

VIRGINIA: Dismal Swamp; VIII, 13, 1931; (R. H. Beamer); 1 ♂; [A.N.S.P.]. Lake Drummond, Dismal Swamp; X, 29, 1906; (H. S. Barber); 1 ♂, 1 ♀; [A.N.S.P.].²⁶

²⁶ Reported as *M. p. arboreus* by Rehn and Hebard in 1916 (Proc. Acad. Nat. Sci. Phila., 1916, p. 247).

NORTH CAROLINA: Southern Pines; IX, 11, 1915; (A. H. Manee); 1 ♂; [A.N.S.P.]: (A. H. Manee); 1 ♂ [A.N.S.P.].

GEORGIA: Vicinity of Stone Mountain; ²⁷ VIII, 3, 1913; (J. C. Bradley); 1 juv. ♀; [A.N.S.P.].²⁶ Coleraine Plantation, near Folkston; I, 4, 1937; (Adrian Colson; "in red-shouldered hawk's stomach") 1 ♀; [A.N.S.P.].

FLORIDA: Walton Co.; ("in wild turkey stomach killed in pine forest"); 1 ♀; [A.N.S.P.].²⁶ Pomona, Putnam Co.; IX, 7, 1917; (R. & H.; "beaten from high grass under scattered pines"); 1 ♀; [A.N.S.P.].²⁸

OKLAHOMA: Perkins; X, 10, 1935; (A. N. Caudell); 1 ♂; [U.S.N.M.].

TEXAS: Dallas; (Boll) 3 ♂, 1 ♀, type, allotype and paratypes; [M.C.Z.]. Gulf Coast of Texas; 1884; (Aaron); 1 ♂, paratype; [M.C.Z.].

"ARIZONA" (??): (Schaupp); 1 ♀; paratype; [A.N.S.P.].²⁹

Atypical *M. p. arboreus*

VIRGINIA: Lake Drummond, Dismal Swamp; X, 29, 1906; (H. S. Barber); 1 ♀; [A.N.S.P.].²⁶

NORTH CAROLINA: Southern Pines; IX, 11, 1915; (A. H. Manee); 1 ♂; [A.N.S.P.].

KANSAS: La Cygne, Linn Co., XI, 6, 1945; (R. H. Beamer); 3 ♂, 2 ♀; [Univ. of Kansas and A.N.S.P.].

Melanoplus punctulatus griseus (Thomas) Text-figs. 9 and 10; plate 1, fig. 21.
1872. *Caloptenus* *griseus* Thomas, Ann. Rep. Geol. Surv. Mont. etc., V, p. 454. [♀; Ohio.]
1875. *Caloptenus helluo* Scudder, Proc. Boston Soc. Nat. Hist., XVII, p. 476. [♀; Dallas, Texas.]

Types and synonymy.—The type of *griseus*, which a prefatory note to the paper in which Thomas described the form states, was the property of the United States Department of Agriculture, but today is not in the series at the United States National Museum, according to information supplied by Dr. Ashley B. Gurney. The specimen, presumably unique, and from the collection of Mr. Charles R. Dodge, was figured by Glover.³⁰

Of the two original female specimens of *Caloptenus helluo* Scudder but one remains in the Scudder series at the Museum of Comparative Zoölogy. It is labelled "Dallas, Texas." "Boll's no. 55." "Scudder's Type 1875" and also bears a red M.C.Z. type label with no. 15503. This specimen I here

²⁷ In this growth stage of individuals of the female sex it is virtually impossible to segregate typical and atypical material.

²⁸ This specimen lacked both caudal limbs when captured, and may have been taken from a tree by a bird and then dropped in the grass beneath.

²⁹ Scudder (Proc. U.S.N.M., XX, p. 373, (1917)) reported this specimen which is typical *arboreus*, and doubtless came from some point in north-central Texas, where Schaupp lived for a number of years. The Arizona species *M. splendidus* is abundantly distinct.

³⁰ Illustr. N. A. Entom., Orth., pl. XII, fig. 14, (1872).

select as the single type (lectotype) of *Caloptenus helluo*. It is identical with material here considered *p. griseus*, with representatives of which it has been compared. Measurements of this lectotype are given in the subjoined table of measurements.

Previous authors have considered most of the features which are here given to distinguish *M. p. griseus* from *M. p. punctulatus* as purely individual variants, and failed to note their geographic correlation. Scudder's description of the cerci of *punctulatus* was drawn entirely from the typical form of the species, although he had material of the present subspecies before him. Rehn and Hebard in 1916³¹ considered the cercal form of *p. punctulatus* to be very variable individually, which was due to the series then before them including material of *p. griseus*, and their failure at that time to appreciate the geographic correlation of the supposedly individual variants.

Principal features.—This western interior race of *punctulatus* can at once be distinguished from the other forms of the species by the boot-shaped cercus of the male, which is quite different in general outline from the flabellate types seen in *p. punctulatus* and *p. arboreus*. The size is essentially as in the former of these two subspecies, while the appreciably more prominent eyes of *p. griseus*, as seen from the dorsum and in cephalic aspect, will serve to distinguish the otherwise quite similar females of these two subspecies. The structure of the aedeagus of the male internal genitalia is quite distinctive when compared with the same parts in either *p. punctulatus* or *p. arboreus*. In material of this subspecies here considered atypical the cercal and aedeagal characters closely approach, but are less extreme than in those considered typical individuals of *p. griseus*. The preceding key to the forms of the group, and the accompanying figures, will make clear the diagnostic features of *p. griseus*, and a full description of the form is unnecessary.

Distribution.—This subspecies apparently is the Mississippi Valley representative of the species north of that area in which *M. p. arboreus* occurs. It extends eastward in Pennsylvania over the Alleghany Plateau and that of North Mountain, and is found on some of the higher ridges to the east of the Alleghany rim (Buffalo Flat), while below in the valleys *M. p. punctulatus* extends in from the east. Similarly, but following a different altitudinal pattern *M. p. griseus* extends down the Potomac Valley until it is found atypical, and in effect intergrading with *M. p. punctulatus*, within a few miles of Washington. The extreme boundaries of the distribution of *M. p. griseus* as represented by material before me are as follows: Bellasylva, Wyoming County, and Buffalo Flat, Union Co., Pennsylvania,

³¹ Proc. Acad. Nat. Sci. Phila., 1916. pp. 246-247, (1916).

at both of which points it occurs at elevations in excess of two thousand feet; Plummer's Island, Maryland; Stubblefield Falls, Virginia; Warroad, Roseau Co., Minnesota; Omaha, Nebraska; and La Cygne, Linn Co., Kansas.

It is presumed that the present subspecies is the form of *punctulatus* found in the southern peninsula of Michigan and probably it also occurs in extreme southern Manitoba and far western Ontario, as it is known from Warroad, Minnesota, which is within a few miles of the Canadian boundary. As far as known *M. p. griseus* fails to reach the Great Plains, but does cross the Missouri River (Omaha) and follows up some of its tributary streams (La Cygne). No information is available regarding its intergradation with *M. p. arboreus* in the broad area reaching from Oklahoma to North Carolina, where the two doubtless intergrade, and no evidence is at hand on the probable intergradation of it and *p. punctulatus* in western New York. The interdigitation of these two forms at La Cygne, in extreme eastern Kansas, also in the Dallas, Texas area is puzzling, and is discussed below under intergradation. The intergradation of *p. griseus* and *p. punctulatus* in the Potomac Valley above Washington has already been discussed under the last mentioned form.

Intergradation.—While the evidence on intergradation between *M. p. griseus* and *M. p. punctulatus* is sufficiently conclusive to show the two are complementary geographic subspecies of the same species, actual intermediates between them are not available, as they are between *p. punctulatus* and *p. arboreus*. Apparently the differentiation of *p. griseus* from both the typical form and from *p. arboreus* is more advanced than that of *p. punctulatus* and *p. arboreus*. In consequence instead of even intergradation we find a definite interdigitation of *p. punctulatus* and *p. arboreus* elements and that of *p. griseus* in certain areas, as in the upper Potomac Valley in the first case, and the La Cygne section of eastern Kansas and the Dallas region of Texas in the second. In all of these districts typical material of one occurs at the same place and at the same time as atypical material of the other. Hence, *p. griseus* seems to be farther advanced in its differentiation from the more eastern and southern stocks than they are from one another. Possibly the divergence of *p. griseus* is definitely older and hence more advanced than the other split, with, in consequence, actual intermediates progressively fewer and *griseus* well on the way to establishment as a distinct specific entity.

Size.—The dimensions of *M. p. griseus* are essentially the same as those of *M. p. punctulatus*, and both sexes are relatively uniform in size, as the measurements (in millimeters) of the following representative individuals will show:

	Length of body	Length of pro- notum	Length of tegmen	Length of caudal femur
Typical <i>p. griseus</i>				
♂, Bellasylva, Penna.	24.1 ³²	4.9	17.2	12.3
♂, Near Pigeon, Penna.	19.9	4.6	16.8	11.7
♂, Cavallo, Ohio	26. ³²	4.9	17.8	12.6
♂, Urbana, Ill.	24.2 ³²	4.9	18.9	12.2
♂, La Cygne, Kansas	23.2 ³²	5.3	19.5	13.
♀, Bellasylva, Penna.	27.8	5.3	19.5 ³³	12.9
♀, Near Pigeon, Penna.	27.5	6.3	22.2	14.
♀, Cavallo, Ohio	28.	5.7	20.5	13.8
♀, Warroad, Minn.	38.2 ³⁴	5.2	17.	12.2
♀, La Cygne, Kansas	30.	6.3	22.2	14.5
♀, Dallas, Texas, type of <i>helluo</i>	27.6	5.3	22.5	14.5
Atypical <i>p. griseus</i>				
♂, Plummer's Island, Md.	24.5 ³²	5.2	18.	13.
♂, Short Mountain, Va.	23.2 ³²	4.9	18.3	12.3
♀, Plummer's Island, Md.	26.	6.	17.2	13.
♀, Short Mountain, Va.	29.3	5.7	18.2	13.2

Bionomics.—The most comprehensive series of observations we have, apparently based on this form, although there naturally referred to as *M. p. punctulatus*, are those given by Cantrall in his study of "The Ecology of the Orthoptera and Dermaptera of the George Reserve, Michigan."³⁵ As these comments show *p. griseus* has essentially the same general habits as *M. p. punctulatus*, within some areas a marked preference for certain species of trees, and in others, as comments here given under listed specimens show, exhibiting a much more decided catholicity in the selection of its habitats.

The earliest date represented by adult material in the series before me is July 13 (Bellasylva, Wyoming Co., Penna.) and the latest November 11 (Plummer's Island, Maryland), with the majority not becoming adult apparently until early August. Immature material, in the instar preceding maturity, is before me taken as late as August 15 (Barrington, Illinois), and at Buffalo Flat, Union Co., Penna., on August 1 but a single adult specimen was taken while immature individuals in the instar preceding maturity were numerous. It was taken at La Cygne, Kansas as late as November 6.

Specimens examined: 76; 37 ♂, 30 ♀, 9 juvs.

Typical *M. p. griseus*

PENNSYLVANIA: Bellasylva, Wyoming Co.; VII, 13, 1901; (Witmer Stone); 1 ♂, 1 ♀; [A.N.S.P.].³⁶ North Mountain; IX, 22, 1935; 1 ♂; [A.N.S.P.]. Buffalo Flat, between Buffalo and Branch Mts., Union Co.,

³² Apex of abdomen abnormally extended to expose internal genitalia.

³³ Apices damaged.

³⁴ Abdomen somewhat abnormally extended.

³⁵ Misc. Publ. Mus. of Zool., Univ. of Michigan, No. 54, 1943. Consult pages 113-116.

³⁶ Reported by Rehn in 1902 as *M. punctulatus* (Ent. News, XIII, p. 313).

elev. 2600 feet; VIII, 1, 1935; (Rehn and Rehn; "few adults, on trunks and branches of second growth oak and alder"); 1 ♂; 7 juvs.; [A.N.S.P.]. Near Pigeon, 8 m. N.E. of Marienville, Forest Co., elev. 1750 feet; VIII, 29, 1935; (Rehn and Rehn; "numerous on the trunks of the smaller live wild cherry trees—two pairs in coitu—two also taken on sweet fern"); 9 ♂, 5 ♀; [A.N.S.P.]. Near Chaffee, Elk Co., elev. 2050 feet; VIII, 29, 1935; (Rehn and Rehn; "found caught on rotten log"); 1 moulted ♂ nymphal skin;³⁷ [A.N.S.P.].

OHIO: Cavallo; IX, 26 and X, 12, 1941 and 1942; 2 ♂, 1 ♀; [A.N.S.P.].

INDIANA: Bloomington; VIII, 22, 1886; 1 ♂; [A.N.S.P.]. Putnam Co.; IX, 11, 1902; (W. S. Blatchley); 1 ♂; [A.N.S.P.]. Marion Co., (W. S. Blatchley); 1 ♀; [A.N.S.P.].

ILLINOIS: Barrington; VIII, 15, 1897; 1 juv.;³⁸ [A.N.S.P.].³⁹ Antioch; VIII, 6, 1930; (Frison and Knight; "on *Larix*"); 1 ♀; [A.N.S.P.].³⁹ Urbana; X, 14, 1906; 1 ♂; [A.N.S.P.].³⁹ Central Illinois; VIII, 27, 1883; (Webster); 1 ♂, 1 ♀; [A.N.S.P.]. State label only; IX (♀ only); 1 ♂, 1 ♀; [A.N.S.P.].⁴⁰ Oakwood; IX, 18, 1927; (T. H. Frison); 1 ♂ [A.N.S.P.].

MINNESOTA: Warroad, Roseau Co.; VII, 18, 1912; (Somes); 1 ♀; [A.N.S.P.].⁴¹ Foxhome, Wilkin Co., VII, 1912; (Howard); 1 ♀; [A.N.S.P.].⁴¹ Taylors Falls, Chisago Co.; X, 5, 1937; (Knutson); 1 ♀; [A.N.S.P.].

NEBRASKA: Omaha; 1 ♀; [A.N.S.P.]: IX, 1896; 1 ♀; [A.N.S.P.].

KANSAS: La Cygne, Linn Co.; X, 28 and XI, 6, 1945; (R. H. Beamer); 9 ♂, 5 ♀; [Univ. of Kansas and A.N.S.P.].⁴²

TEXAS: Dallas; (Boll); 1 ♀, type of *Caloptenus helluo* Scudder; [M.C.Z.].

Atypical *M. p. griseus*

MARYLAND: Point of Rocks; IX, 3, 1929; (H. S. Barber); 1 ♀; [U.S.N.M.].⁴³ Plummer's Island, Montgomery Co.; XI, 11, 1915; (M. Hebard); 4 ♂, 1 ♀; [A.N.S.P.]. Mainland at Plummer's Island; X, 31, 1915; (W. Stone); 1 ♂, 1 ♀; [A.N.S.P.].⁴⁴ Offert's Island; X, 3, 1919;

³⁷ The characteristic form of the male cercus of *p. griseus* is evident in this cast skin.

³⁸ This specimen is placed here purely on geographic grounds.

³⁹ Reported by Hebard (Bull. Ill. Nat. Hist. Surv., XX, p. 196, (1934)) as *M. p. punctulatus*.

⁴⁰ These specimens were reported by Scudder (Proc. U.S.N.M., XX, p. 376, (1897)) as *punctulatus*.

⁴¹ Recorded by Hebard (Univ. Minn., Agr. Exp. Sta., Tech. Bull. 85, p. 35, (1932)) as *M. p. punctulatus*.

⁴² See also atypical *M. p. griseus* and atypical *M. p. arboreus*.

⁴³ See also typical *M. p. punctulatus*.

⁴⁴ Recorded by Rehn and Hebard as *M. p. punctulatus* (Proc. Acad. Nat. Sci. Phila., 1916, p. 246, (1916)).

(H. S. Barber); 1 ♂; [U.S.N.M.].

VIRGINIA: Stubblefield Falls, Fairfax Co; X, 30, 1921; (W. L. McAtee; "on *Pinus virginiana*"); 2 ♀; [U.S.N.M.]. Short Mountain, Massanutten Mts., near Mt. Jackson; X, 10-12, 1940; (Allard and Gurney); 1 ♂, 3 ♀; [U.S.N.M.].

KANSAS: La Cygne, Linn Co.; XI, 6, 1945; (R. H. Beamer); 1 ♂; [Univ. of Kansas].⁴⁵

Melanoplus splendidus Hebard Text-figs. 11-13; plate 1, fig. 22, plate 2, fig. 23.

1920. *Melanoplus splendidus* Hebard, Trans. Amer. Entom. Soc., XLVI, p. 364, pl. XVI, figs. 5-7. [♂ (type), ♀; Jemez Hot Springs, Jemez Mountains, New Mexico (type locality); Jemez Mountains, New Mexico.]

Type material.—Of the original material of this species (two males and six females), the holotype (♂) and allotype (♀), a paratypic male and two paratypic females are before me.

Remarks.—This very distinct species has as its nearest relative *M. macclungi*, here described. The more important characters separating the two species have been given in the preceding key to the species, and in the comparative diagnosis under *M. macclungi*. The two species clearly have had a common ancestry, this perhaps in Pleistocene times, and their respective present-day distributions may be due to Post-Pleistocene conditions with progressive deforestation and aridity of the intervening territory since that period.

Size variation.—The original measurements do not give a full picture of the size variation which we now know is present in *M. splendidus*, even in material from the same locality and environment. The following dimensions give (in millimeters) a better understanding of the considerable variation found, particularly in the female sex, in this species, which in this respect is quite similar to its near relative *macclungi*.

	Length of body	Length of pro- notum	Length of tegmen	Length of caudal femur
♂, Jemez Hot Springs, New Mexico, type (ex Hebard)	25.7	5.8	21.	14.
♂, 2 miles E. of Tesuque Pueblo, New Mexico	23.8	5.7	18.	12.2
♂, 2 miles E. of Tesuque Pueblo, New Mexico	26.5 ⁴⁶	5.8	18.4	13.3
♀, Jemez Hot Springs, New Mexico, allotype (ex Hebard)	38.2	7.4	23.5	17.6
♀, Jemez Hot Springs, New Mexico, paratype	40. ⁴⁷	7.8	23.5	17.3
♀, 2 miles E. of Tesuque Pueblo, New Mexico	28.5	6.3	19.	15.
♀, 2 miles E. of Tesuque Pueblo, New Mexico	33.5	7.	20.	15.
♀, Chappelle, New Mexico	29.	6.8	18.	14.7
♀, Chappelle, New Mexico	33.	6.6	19.2	15.5
♀, E. of Flagstaff, Arizona	36.5 ⁴⁷	6.9	23.	15.3

⁴⁵ See also typical *M. p. griseus* and atypical *M. p. arboreus*.

⁴⁶ Apex of abdomen abnormally extended to expose internal genitalia.

⁴⁷ Abdomen excessively extended.

Bionomics.—Hebard has given a most interesting account of the habits of this species,⁴⁸ as found by him at Rancho del Monte, near Tesuque Pueblo, New Mexico. The majority of the specimens were found on juniper, usually on the twigs just preceding the terminal bunches, and apparently the species was more active at night than in the daytime. The two females from Chapelle, New Mexico were all seen at that time, although long search was made for males. One of these was taken on a rock surface, the other under dead twigs on the ground, both in a park-like stand of juniper and pinyon.

The dates covered by the material extend from July 13 to September 2, but all individuals taken after August 23 are females. Hebard considered the species "reaches its maximum adult abundance about the middle of July." It is clearly local in its occurrence, but doubtless is far more broadly distributed in juniper and pinyon regions than the present information would indicate.

Distribution.—The Rocky Mountain section of Colorado and New Mexico from as far north as Woodland Park, Teller Co., Colorado, south to Chapelle (or Bernal), San Miguel Co., New Mexico, occurring westward in the Jemez Mountains of New Mexico and on the Coconino Plateau of Arizona east of Flagstaff. The known vertical distribution extends from 6150 feet (at Chapelle) to 8479 feet (at Woodland Park). Zonally it is Upper Sonoran, extending into the Transition, at least locally.

Specimens examined: 25, 7 ♂, 17 ♀, 1 juv.

COLORADO: Woodland Park, Teller Co.; 1 juv.; [A.N.S.P.].

NEW MEXICO: Rancho del Monte, 2 miles E. of Tesuque Pueblo, Santa Fe Co., elev. 7000 feet; VII, 13-23, VIII, 29, 1934; (M. Hebard); 5 ♂, 11 ♀; [A.N.S.P.]. Chapelle, San Miguel Co., elev. 6150 feet; VIII, 19, 1939; (Rehn and Rehn); 2 ♀; [A.N.S.P.]. Jemez Hot Springs, Sandoval Co., elev. 6400 feet (1), 7500 feet (2); VIII, 14 and 24, 1913, VIII, 18, 1911; (John Woodgate); 2 ♂, 2 ♀ (type, allotype and paratypes); [A.N.S.P.]. Jemez Mountains; VIII, 1909; (John Woodgate); 1 ♀ (paratype); [A.N.S.P.]

ARIZONA: Coconino Plateau fifteen miles east of Flagstaff, Coconino Co., IX, 2, 1934; (E. D. Ball); 1 ♀; [A.N.S.P.].⁴⁹

⁴⁸ Proc. Acad. Nat. Sci. Phila., LXXXVII, pp. 65-66, (1935).

⁴⁹ Recorded by Hebard, 1935 (Trans. Amer. Entom. Soc., LXI, p. 303).

Melanoplus macclungi⁵⁰ new species

Text-figs. 14-18; plate 2, figs. 24 and 25.

This striking new species shares the dendrophilous habits of the other members of the *Punctulatus* species-group. Its nearest relative is clearly *M. splendidus* Hebard, of Colorado, and northern New Mexico and Arizona, from which the more important differences have been given in the preceding key to the forms. In both sexes the more obvious of these are the more inflated and relatively broader fastigium, and the more strongly marked and far coarser median carina of the metazonal section of the pronotal dorsum. In the male sex the cephalic and median femora, when seen from the dorsum, are appreciably more inflated in *macclungi* than in *splendidus*, the caudal femora have the ventro-external carina more strongly arcuate-expanded as seen in profile, the male cerci have the distal half more evenly falcate, and the distal tubercle of the subgenital plate in the same sex is definitely divided into two lateral nodes. The aedeagus of the internal genitalia of the male of *macclungi* is very similar to that of *splendidus*, as shown by the accompanying figures. In the female sex the ovipositor valves, and particularly the ventral ones, are less elongate and more robust in *macclungi*.

Type.—♂; Sun City, Barber County, Kansas. August 20, 1945. (R. H. Beamer.) [Academy of Natural Sciences of Philadelphia, Type No. 5747.]

Size large for group (length of body of type, 31.8 mm.); form much as in *M. splendidus*, moderately robust; surface moderately polished laterad, ventrad and of face, rather dull dorsad.

Head as seen from dorsum no broader than the cephalic portion of the pronotum, as seen in cephalic aspect with greatest depth faintly greater than 1.5 times the breadth across genae (as 6.5 to 4.5), the genae subdeplanate and not at all inflated, greatest breadth across eyes no greater than that across genae; occiput in profile moderately arcuate, regularly declivent cephalad, the fastigium in this view quite sharply and obliquely descending to the broadly arcuate inter-antennal fastigio-facial juncture; fastigium as seen from dorsum narrow, shallowly concave longitudinally, its low lateral marginal carinae faintly diverging ventro-cephalad, obsolete caudad of the occipital interspace between the eyes, the width of which latter is approximately one-sixth that across eyes (as 5 to 31); frontal costa moderately broad, wider than fastigial grooving (as 7 to 4), subequal in breadth, margins obsolete ventrad, surface briefly well impressed dorsad and ventrad of the ocellus: eyes moderately prominent as seen from dorsum, in basal outline subovoid, flattened on cephalic side, greatest depth about 1.8 times that of infra-ocular sulcus, breadth of basal eye outline approximately seven-tenths of the depth of the same (as 13.5 to 19). Antennae approximately

⁵⁰ Named in memory of the late Dr. Clarence E. McClung, Emeritus Professor of Zoology at the University of Pennsylvania, as an expression of high personal regard and of the esteem in which he was held by all who were privileged to know him well. His discoveries in the cytology of the Acrididae, and his encouragement of all students working in the same or other aspects of that group, have linked his name inseparably with locust study. This dedication is particularly fitting as much of Dr. McClung's life was spent in Kansas, and there, at the University of Kansas, some of his most important cytological work was done.

twice as long as the pronotum, all articles except extreme distal ones relatively attenuate.

Pronotum moderately robust, as seen from dorsum lateral areas of prozona appreciably bullate, greatest breadth across lateral lobes at ventro-caudal angles but slightly less than median length of entire pronotal dorsum (as 42 to 45), dorsal length of prozona 1.2 times that of metazona (as 24 to 20); cephalic margin of pronotal disk weakly arcuate with a shallow and broad median emargination, caudal margin of disk obtuse-angulate, immediate angle moderately rounded; median carina distinctly but not strongly developed on cephalic section of prozona, subobsolete on median and caudal sections of prozona, strongly developed on metazona, and there subtectately elevated; transverse sulci well developed, principal one more deeply impressed than the others, surface of metazona of disk, except for the glabrous median carina, cribrously micro-areolate: lateral lobes with their dorsal length equal to 1.5 times their depth cephalad, their greatest median depth as compared with dorsal length being as 4 to 5, the surface of the two major prozonal sections individually subbullate, surface of lateral metazona as dorsum of same, ventral margin of lobes very broadly obtuse-angulate mesad, regularly passing into the oblique subsigmoid ascending caudal margin of lobes.

Tegmina reaching to apex of abdomen, apex narrowly rounded, longitudinal venation well developed and prominent, general tegminal form as in other members of this group. Wings equaling tegmina in length.

Prosternal spine prominent, erect, subconical, median section of spine with lateral margins subparallel, apex moderately acute. Mesosternal lobes with the interspace moderately longitudinal, subrectangulate, in breadth equal to not over three-fifths that of one of the lobes. Metasternal lobes narrowly separated, outline of metasternal lobes well rounded.

Apex of abdomen faintly enlarged: furcula represented by very short, widely spaced rudimentary rounded lobules; supra-anal plate broadly shield-shaped, the greatest proximal breadth slightly greater than median length (as 19 to 15), apex slightly acute, medio-longitudinal sulcation relatively broad and bounded laterad by subparallel low ridges, laterad of which the surface of the plate is broadly excavate to the ascending lateral rims; cerci extending caudad almost as far as the apex of the supra-anal plate, incurving distad, the distal half particularly in-bent, cercal outline as viewed in lateral aspect narrowing from base to middle, then ascending dorso-distad in a moderately expanded lobate section, the dorsal line of which is nearly straight oblique, the ventral broadly rounded to the quite bluntly rounded apex, external surface of lobate extremity narrowly intermarginally impressed adjacent to the ventral margin (see fig. 15); subgenital plate narrowly produced mesad at dorsal margin, there appreciably labiate, the median production distinctly divided into two rounded lobules (as seen from dorsum) by a median constriction of the marginal alveolar rim. Aedeagus of internal genitalia very similar to that of *M. splendidus* (see fig. 16).

Cephalic and median femora robust, the former particularly quite decidedly inflated and bullate, especially as viewed from dorsum, their length subequal and but slightly less than twice that of the metazona of the pronotum (median). Caudal femora with their apices falling slightly short of

that of the tegmina and of the abdomen, moderately robust as seen in profile and from the dorsum, greatest depth, which is situated slightly proximad of the middle, contained 4.25 times in the femoral length, the whole distal two-fifths of the femur faintly but appreciably tilted dorsad; paginal pattern well impressed and regular; caudal tibiae very slightly shorter than the femora, moderately robust, slightly bowed as seen in profile, external extensor margin with ten rather short and stout spines, internal one with ten to eleven; tarsi with marked and elongate-ovate arolia.

Allotype.—♀; same data as type. [Academy of Natural Sciences of Philadelphia.]

Differing from the preceding description of the male (type) in the following noteworthy respects.

Head as seen in cephalic aspect with greatest depth faintly less than 1.5 times the breadth across genae (as 7 to 4.75), the genae as in male but slightly converging in outline dorsad to the eyes, latter somewhat less prominent than in male, particularly dorsad, greatest breadth across eyes slightly less than that across genae; fastigium in profile with outline more rounded declivent than in male; fastigium as seen from dorsum broader than in male, in entire basal breadth but slightly narrower than the transverse dimension of one of the eyes, the nearly deplanate surface of the fastigial disk constituting approximately two-fifths of the entire breadth of the fastigium, lateral bounding carinae of the disk very weak; obsolete cephalad, width of occipital interspace between eyes approximately one-fifth that across eyes (as 7 to 32); frontal costa markedly broader than in male, 1.5 times as broad as width of fastigial disk (8 to 5), surface impresso-sulcate similar to that of male; eyes less prominent than in male as seen from dorsum, in basal outline somewhat longer and narrower than in male, more elliptoid but with cephalic side as strongly flattened, width of outline equal to approximately six-tenths of length of same (12 to 19). Antennae slightly shorter than in male, all articles except proximal two less attenuate. Pronotum with prozonal section as a whole slightly fuller than in male, the lateral bullate areas of the same as in the latter; cephalic margin of pronotal disk with median emargination subobsolete, obtuse-angulation of caudal margin of disk slightly broader; lateral lobes slightly more quadrate in outline than in male, their greatest median depth as compared with dorsal length being as 4.5 to 6, surface and margins of lobes as in male.

Tegmina falling somewhat short of abdominal apex, in structure as in male.

Mesosternal lobes with the interspace subquadrate, its breadth slightly less than that of one of the lobes. Metasternal lobes somewhat more widely separated than in male.

Abdominal apex very similar to that of the female of *M. splendidus* with the following differences: cerci longer, more slender and attenuate, narrower at the base, with the breadth there contained 1.63 times in the length, instead of 1.16 times as in *M. splendidus*; ovipositor valves, particularly the ventral pair, somewhat less elongate and more robust; disto-lateral angles of the margin of the subgenital plate less acute, hardly sharper than a right angle when contrasted with the definitely acute form found in *splendidus*.

Cephalic and median femora much less robust than in the male sex. Caudal femora essentially as in male sex, but faintly more robust as seen

in profile, the greatest depth contained but 3.8 times in the femoral length,⁵¹ the distal tilt noted in the male not evident in the opposite sex.

Coloration.—In general pattern very similar to that of *M. splendidus*, but averaging somewhat more reddish brown and less gray-brown in tone, and with pattern contrasts somewhat more marked. Base color of head, pronotum, abdomen, tegmina and limbs ranging from clove brown to prout's brown, with the dark overlying pattern fluctuating from mummy brown to blackish fuscous, or at times even blackish on portions of the caudal femora, contrasted pale pattern of portions of head, lateral lobes of pronotum, pleura and caudal femora, and numerous areas of the abdomen, ranging from ochraceous-buff to pale ochraceous-buff, occasionally overwashed with deep olive-buff. Head with a pale area of variable emphasis dorsad on genae bordering a dark postocular stripe, which latter also outlines the eyes ventro-caudad, genae caudad, and particularly ventro-caudad, usually clouded to a greater or lesser degree with fuscous; dorsum of occiput infusate medio-longitudinally to a variable degree; eyes ranging from ochraceous-tawny and buckthorn brown to prout's brown; antennae of base color, darkening distad. Pronotum with region of shoulders of prozona, and much less frequently of metazona as well, marked with dark, this on caudal two-thirds of prozona enclosing a sharply contrasted pale subelliptical spot, which infrequently extends ventrad over the caudal third of the prozona on the lateral lobes, but which usually is there represented by several quite small light blotches, as well as intimations of similar ones more cephalad on the lateral lobes; median carina and transverse sulci marked with blackish. Pleura with one or two oblique pale dashes, these usually quite evident, sutures blackish pencilled. Tegmina with a pattern of small dark fleckings much as in *M. splendidus*. Abdomen with a mottling of light and dark elements, which produces in the male a regular subvermiculate pattern, but which in the female has a greater pale emphasis laterad and a more definite tendency to develop alternating longitudinal groups of light and dark maculae. Cephalic and median femora variably clouded or banded with blackish fuscous, this tone occasionally being lineate to a greater or lesser degree on the caudal face of the cephalic femora. Caudal femora with external paginal area bearing at least two oblique blackish fasciae, more definitely marked on ventral than dorsal half, these bars often coalescing on dorsal half but always pronounced on ventral one; dorsal face usually pale, often unbroken, again crossed by offshoots of the lateral dark barring, a well-marked pale pregenicular section almost always indicated; groove section of ventral surface of caudal femora and most of internal surface deep blood red, broken only by a pale pregenicular cross-bar, which latter is bordered proximad on internal face by a blackish-fuscous cloud, a similar one placed more proximad on internal face: caudal tibiae largely deep maroon to slate-blue with external extensor margin straw-colored and the blackish-fuscous pregenicular section separated from the more extensive tone by an incomplete straw-colored annulus, spines blackish, the internal series pale at immediate bases.

Immature individuals are almost entirely cource green to brice green, with a strikingly marked area dorsad on the prozona of the lateral lobes

⁵¹ This ratio varies individually in the series of females examined, ranging up to 4.11 times in some which have been checked.

green-yellow to naples yellow; other elements of the light and dark pattern of the adults are intimated to a greater or lesser degree, except that the general green tone replaces all the red, maroon or slate-blue of the adults on the caudal limbs.

Size.—The species is relatively variable in size individually in both sexes, as the following measurements (in millimeters) demonstrate:

	Length of body	Length of pro- notum	Length of tegmen	Length of caudal femur
Sun City, Kansas				
♂, <i>type</i>	31.8	6.9	22.	15.4
Average and extremes of fifteen males	30.2 (27.5-33)	6.7 (6-7.5)	21.4 (19-23.2)	14.7 (13.3-16.2)
♀, <i>allotype</i>	36.5	8.	22.5	16.3
Average and extremes of fifteen females	37.3 (32.3-42.2)	7.6 (7.1-8.5)	22.5 (19.3-27.5)	16.4 (14.9-18)

None of the above measured males have had the abdomens extended by relaxation and extrusion of the internal genitalia, nor do any of the females similarly listed have the abdomens excessively extended, as is frequently true of gravid individuals of that sex or those taken while ovipositing.

Immature stages.—Seven immature individuals, representing both sexes and in the instar preceding maturity, taken with adults at the type locality on August 20, 1945, have been examined. As shown in the preceding color description these are all distinctly greenish in their general coloration, with the pale areas in the usual position of prozonal lateral carinae strongly marked and contrasted, while there is no intimation of maroon or slate-blue coloring on the limbs, and the caudal femora have a superimposed dark pattern made up of dots and lines and nowhere solid. These specimens show that not all specimens of the species are adult by August 20, although the majority are.

Variation.—The size and color range evident in the considerable series of this species have been discussed or made evident in preceding paragraphs. As the range and average measurements shown above indicate, the feature of most marked size variation is the tegminal length, which exhibits a range as great as thirty-six (♀) to thirty-eight (♂) percent of the average for these sexes. This is approximately double the percentage found in the respective sexes in the length of the caudal femora, while that in the pronotal length is but eight (♀) to twenty-two (♂) percent of the average shown. It is thus evident that the tegminal length varies greatly in individuals of both sexes, and is definitely more subject to marked fluctuation than the pronotal or caudal femoral length. There is a slight amount of variation in the relative depth of the caudal femora, particularly in the male sex, but this is definitely less than is frequently encountered. Similarly there is a slight but definite degree of individual variation in the emphasis of the bullation of the cephalic femora in the male, as is the case in many acridids displaying similar developments.

The distinctive characters of the genitalia seem fixed and little subject to variation.

Bionomics.—As is the case with its relatives, *macclungi* is definitely dendrophilous in habits. The following extract from a letter of Dr. R. H. Beamer supplies the essential information on this phase of the life-history of the species: "These specimens were all swept from native cedar (i.e. *Juniperus virginiana*) about four or five miles south of Sun City, Kansas. They were mostly along the lower branches of the cedars. The time was about four o'clock in the afternoon. Some of the specimens were in copula. They would occasionally fly off to the ground, but usually would try to dodge around the limb out of sight, but the limbs for the most part were too small to hide them." Relative to material taken on a subsequent visit to the same locality, on August 20, 1945, he writes: "These are from the same set of trees as the first series. There are also included a few nymphs which were collected at the same time. We found the nymphs and mating pairs the morning we went there. I do not think there is any doubt that the species lives on the wild cedar."

Paratyptic series.—In addition to the type and allotype I have before me 79 males and 86 females from the type locality, taken August 20, 1945 and September 14, 1944, by Dr. R. H. Beamer, all of which are here considered paratypes. These specimens are the property of the University of Kansas and the Academy of Natural Sciences of Philadelphia.

Specimens examined: 174; 80 ♂, 87 ♀, 7 juvs.

KANSAS: Sun City; IX, 14, 1944; (R. H. Beamer); 17 ♂, 23 ♀, (*paratypes*): VIII, 20, 1945; (R. H. Beamer); 63 ♂, 64 ♀, (*type, allotype and paratypes*) 2 juv. ♂, 5 juv. ♀; [Univ. of Kansas and A.N.S.P.].

EXPLANATION OF PLATES

PLATE 1

Fig. 19.—*Melanoplus punctulatus punctulatus* (Scudder). Male; Rockport, Maine. Lateral view ($\times 2\frac{1}{2}$).

Fig. 20.—*Melanoplus punctulatus arboreus* Scudder. Male; Southern Pines, North Carolina. Lateral view ($\times 2\frac{1}{2}$).

Fig. 21.—*Melanoplus punctulatus griseus* (Thomas). Male; Near Pigeon, 8 miles N. W. of Marienville, Forest Co., Pennsylvania. Lateral view ($\times 2\frac{1}{2}$).

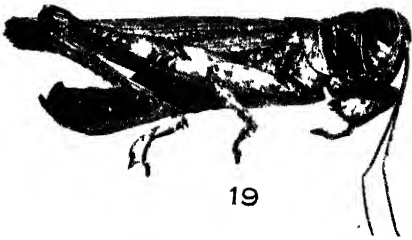
Fig. 22.—*Melanoplus splendidus* Hebard. Male; 2 miles E. of Tesuque Pueblo, New Mexico. Lateral view ($\times 2\frac{1}{2}$).

PLATE 2

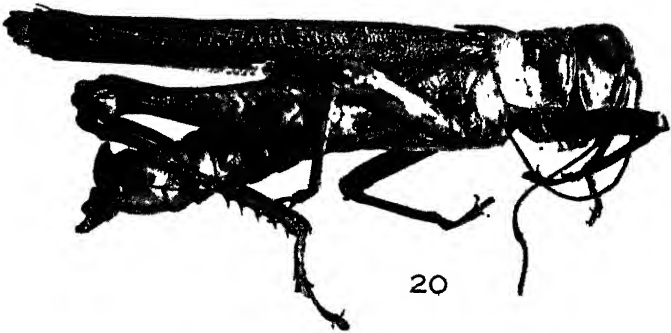
Fig. 23.—*Melanoplus splendidus* Hebard. Female; same locality as fig. 22. Lateral view ($\times 2\frac{1}{2}$).

Fig. 24.—*Melanoplus macclungi* new species. Male (*type*); Sun City, Kansas. Lateral view ($\times 2\frac{1}{2}$).

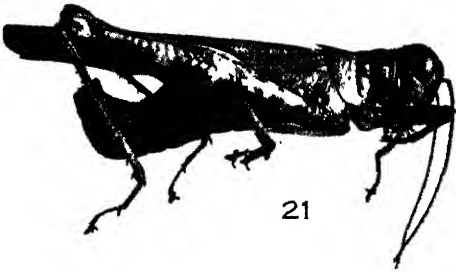
Fig. 25.—*Melanoplus macclungi* new species. Female (*allotype*); same locality as fig. 24. Lateral view ($\times 2\frac{1}{2}$).



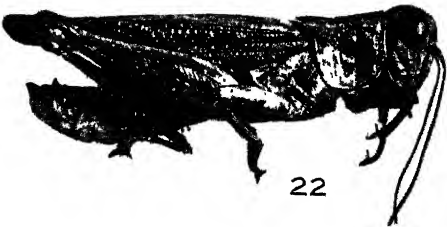
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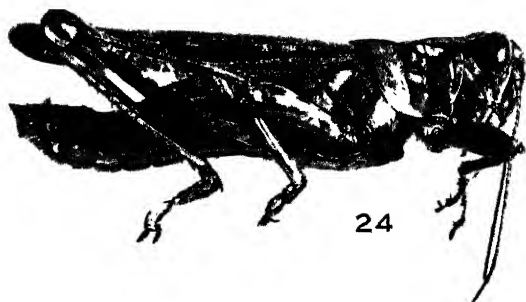
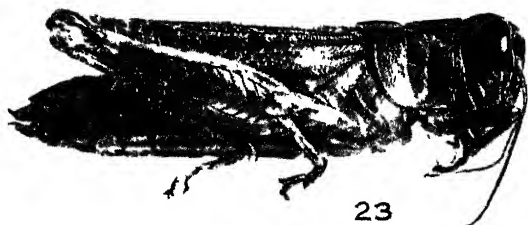
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THE NATURALIST IN LEIDY'S TIME AND TODAY ¹

BY ERNST MAYR

*Curator of the Whitney-Rothschild Collections, Department of Birds,
The American Museum of Natural History*

Leidy was a naturalist with a staggering breadth of interest. His range of knowledge included not only the animal kingdom from protozoa to man, but also such other branches of natural history as geology, mineralogy, and botany. Leidy has been acclaimed with equal justification as the father of protozoology, of parasitology, and of vertebrate paleontology in America. He was one of the outstanding human anatomists of his day. He was the last great naturalist of the old school. Never again will there be another individual with a similar encyclopedic knowledge and an equal opportunity to become the pioneer of any field he chooses to enter.

It is of interest to study the work of Leidy and of his contemporaries in an effort to shed some light on the factors responsible for this phenomenal universality. After going through his bibliography of more than 600 titles, and after studying all of his major publications, I have come to the conclusion that a universality such as Leidy's was possible only in a period when nearly all the fields of natural history were still virgin territory. The mere fact that so little was known about almost any subject of natural history was conducive to a broadening of interest. Leidy himself commented on this in his monograph of the fresh-water rhizopods:

"I may perhaps continue in the same field of research and give to the reader further results, but cannot promise to do so, for though the subject has proved to me an unceasing source of pleasure, I see before me so many wonderful things in other fields that a strong impulse disposes me to leap the hedges to examine them."

The pioneer naturalist is both fortunate and unfortunate. He is fortunate because there is no limit to the number of new kinds of animals and animal structures he can discover. He is unfortunate because he has to be satisfied with merely describing this endless diversity of nature without being able to utilize his very incomplete raw material for generalizations and for the building of biological theories. Leidy clearly recognized this

¹ This paper was presented as an address on the occasion of the Award of the Leidy Medal to Dr. Mayr. A list of the committee recommending Dr. Mayr for the eighth award of this medal, and an account of the proceedings will be found on a subsequent page.

limitation of his period and devoted all of his energies to the accumulation of facts, which are as valid today as they were 100 years ago, while the premature speculations of some of his contemporaries are now largely forgotten.

The naturalist of today finds himself in a vastly different position. No matter what group he wants to study, he must spend months, if not years, to become familiar with the literature. And, in the end, he usually finds that his discoveries have already been anticipated by an earlier worker. The days of the pioneer worker are past, the old naturalist is dead.

It has of late become fashionable to speak of the "new systematics" and of the "new natural history." Is there any justification for these terms and, if so, what do they mean? What is "new" and how does it differ from the classical concepts of these fields? A comparison of a representative publication from Leidy's days with a recent one soon reveals the difference. Natural history in Leidy's time was essentially a descriptive and analytical science. Its main question was: "What?" By answering this question it accumulated a vast store of facts and built the foundation for the labors of the next generation. The new natural history wants to interpret these facts and asks therefore: "How?" and "Why?" In order to answer these questions it must correlate its findings with those from various border sciences, such as zoogeography, ecology, genetics, animal psychology, and other subdivisions of general biology. To illustrate this necessity I shall list a few problems that have actually confronted me in my recent studies, and which I could not even have attempted to solve without the help of these other sciences: the nature of the barriers that reduce gene flow between populations; the influence of effective population size on evolutionary rate; geographical variation of the components of reproductive isolating mechanisms; dispersal rates and facilities; the relation between individual and geographical variation; the taxonomic status of peripheral populations and their possible ranking as incipient species; and the relation between taxonomic patterns and method of reproduction. All of these problems are of vital interest to the biologically-minded taxonomist, but none of them can be solved completely with the orthodox methods of taxonomy.

We marvel at Leidy's universality, his ability to write with equal competence on protozoa and intestinal worms, on living snails and fossil vertebrates. However, he was in all these fields primarily a descriptive taxonomist and anatomist. His diversity of interest in objects was thus compensated by a restriction in method. The opposite is true for the naturalist-taxonomist of today. He is usually extremely specialized in his field, which may be North American fresh-water fishes, parasitic wasps, or South Sea birds, but he compensates this narrowness of material by a diversity of approach. A discussion of some of the recent developments of the species concept will demonstrate to you the reason for this breadth of interest.

The most important working unit of the naturalist is the species, just as the cell is for the histologist, or the element for the chemist. It is of the utmost importance to him to have a clear understanding of what a species is and how it originates. To follow the history of the changes in the species concept is a fascinating endeavor since it sheds a good deal of light on the general principles of the growth of a scientific idea. It seems typical for all sciences that there is a continuous see-sawing between simplifying and complicating discoveries. The original establishment of the species concept by Ray and Linnaeus and the introduction of binomial nomenclature was perhaps the greatest simplifying event in the field of natural history. It brought order into the seeming chaos of nature's diversity. The species concept of Linnaeus was that of the local naturalist. He found the various kinds of animals and plants near his home in southern Sweden as well defined and as sharply delimited from each other as are, for example, the five thrushes of the genus *Hylocichla* in eastern North America.

This concept of the well-defined species of a local fauna lost its simplicity when explorers began to gather specimens from a dense network of localities all over the world. It was found, for example, that there are song sparrows in most parts of North America, but that the song sparrows of New Mexico, of California, of Alaska, or of the Aleutians, are by no means the same as the eastern North American Song Sparrow originally named by Wilson. Are all these song sparrow populations separate species, and, if not, what are they? After about seventy years of hesitation, naturalists finally realized that the original Linnaean species concept had to be broadened to take cognizance of the newly found evidence. To use an analogy from the field of geometry, we can say that the Linnaean species had no dimensions, since it dealt with the delimitation of natural populations at a single locality and at a single time level. The scientific exploration of the whole world in the post-Linnaean period resulted in the addition of longitude and latitude to the domain of the taxonomist. Taxonomy thus became two-dimensional and it became necessary to replace the simple binomial species of Linnaeus by the polytypic, trinomial species of recent authors. This step brought with it a tremendous simplification in well-worked taxonomic groups. It was possible, for example, to reduce the 19,000 species of birds which Sharpe recognized in 1910 to about 8,600. However, this simplification was bought at the price of new complications, the most important one of which was that it was no longer possible to define polytypic species on an entirely morphological basis. Many polytypic species contain subspecies that are morphologically as distinct as full species but are connected by intermediate populations.

The greatest difficulty, however, was caused by the existence of isolated populations which were distinct enough so that they could be considered

either subspecies or species. The study of such populations, although they are of considerable annoyance to the orderly mind of the classifying taxonomist, actually helped to solve one of the greatest puzzles of recent biology.

To explain this, let me go back to the Linnaean species of a local fauna. Such closely related species as, for example, the five thrushes of eastern North America: the Wood Thrush, the Veery, the Hermit Thrush, the Olive-backed Thrush, and the Gray-cheeked Thrush, are so completely distinct from each other, not only in their morphology but also in habits and ecology that not a single intermediate is known. The same is, on the whole, true for any group of closely related sympatric species. The evolutionist was justifiably puzzled by this absence of connecting links between such species. As recently as 1922, the then leading British geneticist Bateson had to admit: "When students of other sciences ask us what is now currently believed about the origin of species, we have no clear answer to give. That particular and essential bit of the theory [of evolution] which is concerned with the origin and nature of species remains utterly mysterious."

It was the naturalist who found the answer to the problem of the multiplication of species. New species do not—or only under exceptional circumstances—develop through the splitting of a single population at a given locality. No, new species develop from spatially isolated populations. The result of this discovery was that the study of geographical variation has become an important field of biological research, in the pursuit of which taxonomists have been joined to an ever-increasing extent by geneticists and ecologists.

I might add that the picture I have just painted has been proven so far only for land vertebrates, some insects and a few other groups. It appears probable that it is valid for all sexually reproducing terrestrial animals. On the other hand, next to nothing is as yet known about the speciation mechanisms of oceanic animals, of animals with various kinds of asexual reproduction mechanisms and of species with aberrant ecological specializations. Here is a fertile field of research for the naturalist of the future.

There is one other aspect of the species which has changed fundamentally within recent times. I am referring to the species definition. The morphological species definition of the old naturalist is being replaced to an increasing extent by a biological definition. Its species criterion is not the degree of morphological difference, but rather the presence or absence of interbreeding. I have worded this definition as follows: "Species are groups of actually or potentially interbreeding natural populations which are reproductively isolated from other such groups." It would lead too far to discuss at this occasion the reasons for this shift to the biological species concept. It is partly the consequence of the proven unreliability of morphological characters in variable species and in isolated populations, and partly

the result of the discovery of an ever-increasing number of so-called cryptic or sibling species. We have no way of estimating how common these are, but they have turned up in numbers in all intensively worked families, as, for example, in the genus *Drosophila*, among mosquitoes, among moths, and among grain-infesting beetles. In all these cases there is a complete lack of interbreeding in nature between species which are morphologically almost or completely indistinguishable. Such cases challenge the naturalist. He can no longer trust purely morphological characters of dead specimens, he must study these animals in nature. The taxonomist of such groups must be a true outdoor naturalist.

Also, he is required to make a study of the various factors that prevent related species from interbreeding, the so-called isolating mechanisms, and finally he must study the ecological differences between them. For, no matter how closely related two sympatric species are, they will show on close analysis certain differences in their food and habitat requirements. This has been vaguely known to naturalists for a long time, but the true significance of this phenomenon has been realized only recently, through the studies of Gause, Lack, and other naturalists. The Gause principle states roughly that owing to the competition between related species for food and space, there will be a selective premium on differences in their habitat requirements.

These two newly developed fields, the study of isolating mechanisms and the study of the ecological differences of closely related species, are not only of considerable theoretical significance for the understanding of the process of speciation but are also of great practical value. The discovery that the malaria mosquito of Europe actually consists of a group of six different species has profoundly affected the control measures.

In my discussion of the problems of the new natural history I may have given the one-sided impression that the *whole* field has radically changed since Leidy's time. Actually, in every naturalist-taxonomist there is a bit of the old and a bit of the new. Leidy himself, typical as he was of the old school of natural history at its best, has left in his writings scattered remarks that indicate his keen interest in what we would now call the new natural history. I would like to refer, for example, to his discussion of the possible causes for the extermination of the horse in North America and his penetrating observations on the change of host in the parasitic worm *Gordius*. On the other hand, there are vast fields of natural history where even today only descriptive-analytical work can be done. We ornithologists are lucky in that our predecessors have practically completed the analytical phase, and that the present generation of workers can concentrate on the synthetic aspects of the new natural history with all the interesting problems outlined above.

The taxonomist of today who wants to take advantage of these opportunities must be a naturalist in the broadest and best sense of the word, that is, a student of nature in all of its aspects. In addition to being a morphologist, he must be a zoogeographer, an ecologist, and a student of animal behavior. He must combine this with a knowledge of borderline sciences, such as genetics, geology, and statistics. If he has this equipment, he will be more than merely a cataloguer of nature. He will then be able to make major contributions to the field of general biology, contributions on evolutionary, zoogeographical, and ecological problems.

And, if I can judge from my own experience, the new naturalist will derive as much pleasure from the pursuit of his studies as did the old naturalist. Leidy, in his monograph of the Rhizopods, described these sentiments so well that I shall quote them in a concluding paragraph:

"The study of natural history in the leisure of my life, since I was fourteen years of age, has been to me a constant source of happiness, and my experience of it is such that, independently of its higher merits, I warmly recommend it as a pastime, than which, I believe, no other can excel it. At the same time, in observing the modes of life of those around me, it has been a matter of unceasing regret that so few, so very few, people give attention to intellectual pursuits of any kind."

The army of naturalists has grown tremendously since Leidy's time. Let us hope that an ever-increasing number of people find happiness and recreation in the study of nature.

ABSTRACT OF MINUTES OF THE PROCEEDINGS OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA

FEBRUARY 19, 1946

One hundred and thirty-fourth Annual Meeting of the Academy.

Two hundred and seven members and guests present.

President Charles M. B. Cadwalader in the Chair.

Annual report for the year 1945 was presented by the President. This report covered the work of all the scientific departments, as well as the Library, Educational, Museum Exhibits and Photographic Departments.

The Treasurer also made a report covering the finances of the institution.

During the year a total of 233 new members were elected to the Academy in the following classes: Annual, 178; Junior, 49; Contributing, 3; Life, 3.

The following changes in membership since the last report were presented as follows: Junior to Annual, 3; Annual to life, 3; Life to Associate Sustaining, 2; Associate Sustaining to Sustaining, 4.

During the year 1945 the Academy lost 42 members by death.

Following their nomination as prescribed by the By-Laws of the Academy, the following individuals were elected members of the Board of Trustees for the period extending to the Annual Meeting, 1949: Charles M. B. Cadwalader, R. Meyer de Schauensee, Henry S. Drinker, Thomas S. Gates, J. Stogdell Stokes.

Following an Academy policy, which came into being in 1941, of having a member of the scientific staff or other distinguished scientist deliver an address, the latter part of the meeting was devoted to hearing a paper prepared by James A. G. Rehn, Curator of Insects and Corresponding Secretary. Mr. Rehn discussed the entomological collections of the Academy under the title, "Two and a Half Million Insects." He gave a detailed review of how these collections came into being, explained their care and what they mean to systematics and the scientific knowledge of the world.

At the end of Mr. Rehn's address, the members were directed by the ushers to the reading room of the Library where an informal reception was held, with refreshments which, following another Academy custom in connection with certain membership events, had been contributed by a member.

ELECTION OF OFFICERS

At a meeting of the Board of Trustees of the Academy, held February 26, 1946, the following officers were elected:

President: Charles M. B. Cadwalader

Vice President: Edwin G. Conklin

Vice President: R. Meyer de Schauensee

Treasurer: Arthur E. Newbold, Jr.*

Secretary and Assistant Treasurer: John E. Bowers

Corresponding Secretary: James A. G. Rehn

* Deceased Sept. 3, 1946.

THE EIGHTH AWARD OF THE LEIDY MEDAL

On March 22, 1946, the President of the Academy appointed the Committee on the Eighth Award of the Leidy Medal. On June 25, the members of the Committee unanimously recommended the presentation of the Award to Dr. Ernst Mayr, Curator of the Whitney-Rothchild Collections, Department of Birds, The American Museum of Natural History:

The formal presentation of the Medal was made at a special meeting of the Academy on October 2, 1946, at which members of the Academy, of its staff, and guests were present. Dr. Philip P. Calvert of the Academy staff and chairman of the selection Committee made the presentation. In conferring the Award, Dr. Calvert made the following remarks:

Mr. President, Dr. Mayr, and all those assembled here and now in honor of Dr. Joseph Leidy, past president of this Academy: Greeting.

Yesterday afternoon, at the regular monthly meeting of the Council of the Academy, I learned, for the first time, that it was President Calwalader's wish that I should introduce our speaker of the day at this meeting. The shortness of this notice is fortunate. If it had been given a long time in advance, perhaps I might have felt it my duty to prepare an introduction of such length as to unconsciously and unconscionably occupy so much time as to leave none for our honored guest. Such calamities have been reported in ancient and in modern history.

Now, however, such a disaster has been averted. There remains but for me to say that the Leidy Medal, established by Dr. Joseph Leidy, Jr., in memory of his uncle, is awarded once in three years for the best publication, exploration, discovery or research in the natural sciences; that Dr. Ernst Mayr was nominated for this award for his wide field and museum experience in ornithology, and especially his knowledge of the distribution of the species and subspecies of birds in the South Pacific Islands, on which he has published largely. This knowledge, combined with wide reading in other fields of zoology, is embodied in his recent important book—*Systematics and the Origin of Species*. 1942; and that after due consideration by the Leidy Medal Award Committee, consisting of Professor Charles A. Kofoid of the University of California; President Alexander G. Ruthven of the University of Michigan; Professor J. T. Patterson of the University of Texas; and Dr. J. Percy Moore, Dr. H. Radclyffe Roberts and the speaker, of the local membership of the Academy, the award is made unanimously to Dr. Ernst Mayr, of the American Museum of Natural History, New York.

Therefore, I have the honor to present, on behalf of this Academy, the Leidy Medal of 1946 to Dr. Mayr.

(Dr. Mayr's address, following the presentation of the Medal, will be found on page 271 of this volume.)

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ERRATUM

Page 109, line 12, for *Miscroscelis*, read *Microscelis*

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